Table 8
Summary of Results for Locations With Airborne Fiber Levels Higher Than Levels in Comparison Areas Above 59th Street.

Air samples were collected and analyzed by phase contrast microscopy for total fibers (NIOSH 7400). All samples with fiber counts higher than the comparison areas above 59th Street were re-analyzed to determine if those fibers were asbestos, synthetic vitreous fibers (SVF), or other material.

Building (Area)	Aggressive Sampling[a]	Fibers in Air by PCM (f/cc)[b]	Asbestos in Dust by PLM or TEM[c]	Asbestos in Air by TEM (f/cc)[b]	SVF in Dust by PLM	SVF in Air by SEM (f/cc)[b]
1 (Residence)	No	0.006	ND[g]	<0.001[d]	20%	0.000162
2 (Common)	No	0.005	ND[g]	<0.001[d]	27%	0.000255
19 (Common)	No	Overloaded[e]	ND[g]	<0.006[f]	ND	Not analyzed
24 (Residence)	No	0.005	ND[g]	<0.001[d]	10%	0.000037
26 (Common)	No	0.004	ND[g]	<0.001[d]	5%	<0.00004
26 (Residence)	No	0.012	ND[g]	<0.001[d]	ND	<0.00004

a. Aggressive sampling refers to a technique used in some residential units where the vacuum exhaust (used for settled dust sample collection) was used to stir up the settled surface dust before the air sampling began.

b. f/cc = fibers in each cubic centimeter (cc) of air as determined using phase contrast microscopy (PCM), transmission electron microscopy (TEM), or scanning electron microscopy (SEM) methods. This is calculated from the number of fibers seen on the air filter and the volume of air pulled through the filter measured in cubic centimeters of air.

c. Value shown represents the highest of polarized light microscopy (PLM) or TEM results for this area.

d. The TEM method employed here, National Institute of Occupational Safety and Health (NIOSH) 7402, counts fibers of the same size as those detected by PCM analysis. Fibers reported here are greater than or equal to 5 microns in length and 0.25 microns in width.

e. A building renovation project was occurring near the area of this sampling equipment. Construction dust and building insulation material may have influenced this sample.

f. Sample processing of the overloaded filter involved transferring the material to a new filter; this process provides less analytical sensitivity, resulting in a higher detection limit.

g. ND = not detected.

Table 9
Summary of Airborne Fibers at Locations Where Asbestos Was Detected in Settled Surface Dust

Outdoor Areas in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
1	Outdoor	<1%	22%	No	0.001 f/cc
2[e]	Outdoor	1.3%	28%	No	0.003 f/cc
5	Outdoor	3.4%	25%	No	0.002 f/cc
7	Outdoor	1.7%	35%	No	<0.001 f/cc
15	Outdoor	1.9%	72%	No	<0.001 f/cc
27	Outdoor	<1%	15%	No	<0.001 f/cc

Common Areas in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
4	Common	<1%	15%	No	0.001 f/cc
6	Common	<1%	10%	No	<0.001 f/cc
10	Common	1.5%	20%	No	0.002 f/cc
24	Common	<1%	5%	No	0.001 f/cc
27	Common	<1%	10%	No	<0.001 f/cc

Residential Units in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
4	Residence 1	<1%	2%	Yes	<0.001 f/cc
4	Residence 2	<1%	5%	Yes	0.001 f/cc
5	Residence 1	<1%	10%	Yes	0.002 f/cc
5	Residence 2	<1%	20%	Yes	<0.001 f/cc
9	Residence 1	<1%	2%	Yes	0.001 f/cc
9	Residence 2	<1%	5%	Yes	0.003 f/cc
11	Residence 1	<1%	ND	Yes	<0.001 f/cc
11	Residence 2	1.5%	ND	Yes	<0.001 f/cc
15	Residence 1	<1%	ND	Yes	<0.001 f/cc
27	Residence 1	<1%	10%	No	<0.001 f/cc

a. Value shown is highest of the reported polarized light microscopy (PLM) and transmission electron microscopy (TEM) results for this area.
b. SVF = synthetic vitreous fibers. Measured by PLM analysis.
c. Aggressive sampling refers to a technique used in some residential units where the vacuum exhaust (used for settled dust sample collection) was used to stir up the settled surface dust before the air sampling began.
d. f/cc = the fibers in each cubic centimeter (cc) of air. This is calculated from the number of fibers seen on the air filter and the volume of air pulled through the filter measured in cubic centimeters.
e. Building 2 also had a co-located dust sample; values represent the highest measured result.

Table 10
Summary of Airborne Fibers at Locations Where Only Synthetic Vitreous Fibers (SVF) Were Detected in Settled Surface Dust

Outdoor Areas in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
18	Outdoor	ND[f]	30%	No	<0.001 f/cc
24	Outdoor	ND[f]	55%	No	0.002 f/cc
28	Outdoor	ND[f]	15%	No	<0.001 f/cc

Common Areas in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
2	Common	ND[f]	27%	No	0.005 f/cc[e]
7	Common	ND[f]	5%	No	0.001 f/cc
14	Common	ND[f]	5%	No	0.003 f/cc
25	Common	ND[f]	5%	No	<0.001 f/cc
26	Common	ND[f]	5%	No	0.004 f/cc[e]
28	Common	ND[f]	10%	No	0.001 f/cc

Residential Units in Lower Manhattan

Building	Area	Asbestos in Dust (PLM or TEM)[a]	SVF in Dust (PLM)[b]	Aggressive Sampling[c]	Fibers in Air (PCM)[d]
1	Residence 1	ND[f]	20%	No	0.006 f/cc[e]
1	Residence 2	ND[f]	20%	Yes	<0.001 f/cc
2	Residence 1	ND[f]	25%	No	<0.001 f/cc
2	Residence 2	ND[f]	20%	Yes	0.002 f/cc
6	Residence 1	ND[f]	15%	Yes	<0.001 f/cc
6	Residence 2	ND[f]	15%	Yes	<0.001 f/cc
7	Residence 2	ND[f]	5%	No	<0.001 f/cc
10	Residence 1	ND[f]	15%	Yes	0.001 f/cc
10	Residence 2	ND[f]	10%	Yes	0.001 f/cc
12	Residence 1	ND[f]	5%	No	0.001 f/cc
12	Residence 2	ND[f]	5%	Yes	<0.001 f/cc
13	Residence 1	ND[f]	10%	Yes	0.003 f/cc
15	Residence 2	ND[f]	5%	Yes	<0.001 f/cc
18	Residence 1	ND[f]	30%	No	0.002 f/cc
18	Residence 2	ND[f]	35%	No	0.002 f/cc
24	Residence 2	ND[f]	10%	No	0.005 f/cc[e]
25	Residence 1	ND[f]	5%	No	<0.001 f/cc
27	Residence 2	ND[f]	10%	No	<0.001 f/cc

a. Value shown is highest of the reported polarized light microscopy (PLM) and transmission electron microscopy (TEM) results for this area.
b. SVF = synthetic vitreous fibers. Measured by PLM analysis.
c. Aggressive sampling refers to a technique used in some residential units where the vacuum exhaust (used for settled dust sample collection) was used to stir up the settled surface dust before the air sampling began.
d. f/cc – the fibers in each cubic centimeter (cc) of air. This is calculated from the number of fibers seen on the air filter and the volume of air pulled through the filter measured in cubic centimeters.
e. Scanning electron microscopy (SEM) and TEM results for these air samples are available and shown on Table 8.
f. ND – not detected.

Table 11
Summary of Minerals in Indoor and Outdoor Air From Lower Manhattan and Comparison Buildings Above 59th Street [a, b, c]

	Air Samples from Lower Manhattan							*Air Samples From Comparison Buildings*						
	Number of Samples	Quartz	Calcite	Portlandite	Gypsum	Mica	Halite	Number of Samples	Quartz	Calcite	Portlandite	Gypsum	Mica	Halite
PM 100														
Number (Frequency detected %)	101	14 (14%)[d]	9 (9%)	8 (8%)	24 (24%)	2 (2%)	4 (4%)	7	ND[f]	ND	ND	1 (14%)	ND	ND
Air Concentration (µg/m³)		3–13 J[e]	3–14 J	16–95 J	3–14 J	9–13 J	4–14 J					3 J		
PM 10														
Number (Frequency detected %)	105	11 (10%)	10 (10%)	10(10%)	33 (31%)	1 (1%)	5 (5%)	10	ND	ND	ND	3 (30%)	ND	ND
Air Concentration (µg/m³)		3–12 J	3–5 J	14–25 J	3–14 J	8 J	4–5 J					3 J		
PM 4														
Number (Frequency detected %)	114	13 (11%)	13 (11%)	12 (11%)	40 (35%)	4 (4%)	3 (3%)	11	ND	ND	ND	3 (27%)	ND	ND
Air Concentration (µg/m³)		4–19 J	4–10 J	21–84 J	4–15 J	14–43 J	7–19 J					5 J		
PM 2.5														
Number (Frequency detected %)	34	1 (3%)	ND	ND	1 (3%)	ND	ND	6	ND	ND	ND	1 (17%)	ND	ND
Air Concentration (µg/m³)		3 J			3 J							3 J		
Range of Detection Limits (µg/m³)														
PM 100		2–5 J	2–5 J	12–26 J	2–5 J	7–15 J	4–8 J		2–5 J	2–5 J	12–26 J	2–5 J	7–15 J	4–8 J
PM 10		2–5 J	2–5 J	12–26 J	2–5 J	7–15 J	4–8 J		2–5 J	2–5 J	12–26 J	2–5 J	7–15 J	4–8 J
PM 4		4–6 J	4–6 J	20–30 J	4–6 J	11–17 J	6–9 J		4–6 J	4–6 J	20–30 J	4–6 J	11–17 J	6–9 J
PM 2.5		2–4 J	2–4 J	13–20 J	2–4 J	7–11 J	4–6 J		2–4 J	2–4 J	13–20 J	2–4 J	7–11 J	4–6 J

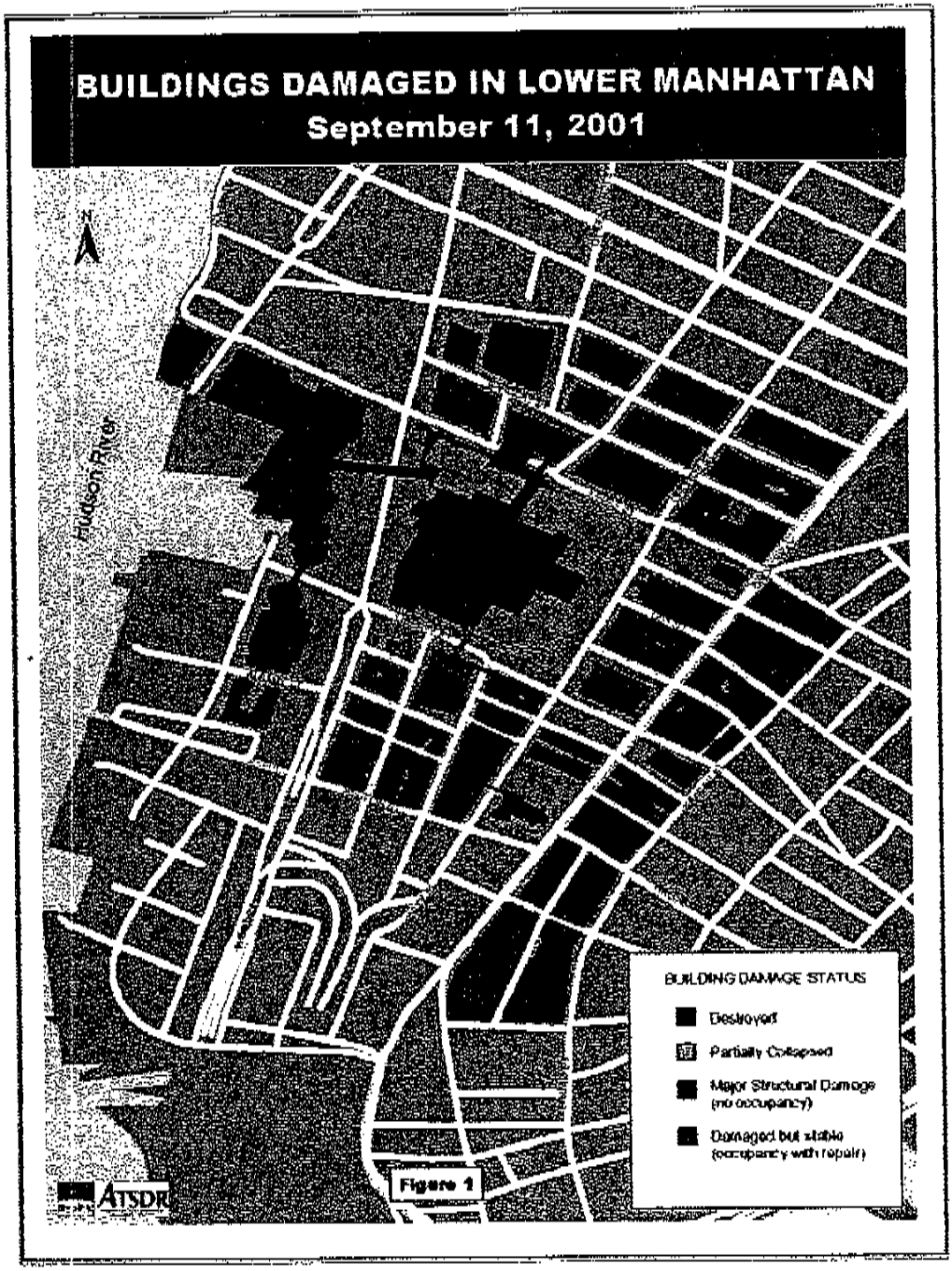
a. Where two samples were co-located—the greatest value of the two was included in this summary. Each location is only represented once in this table.
b. Concentrations shown are estimated values, indicated by "J."
c. Air samples from all locations, indoor and outdoor, are pooled in this table due to uncertainties in the data.
d. Cristobalite, a different crystalline form of silica, was found in one Lower Manhattan air sample at 15 micrograms per cubic meter of air (µg/m³) J in the PM 100 fraction.
e. J = estimated.
f. ND = not detected.

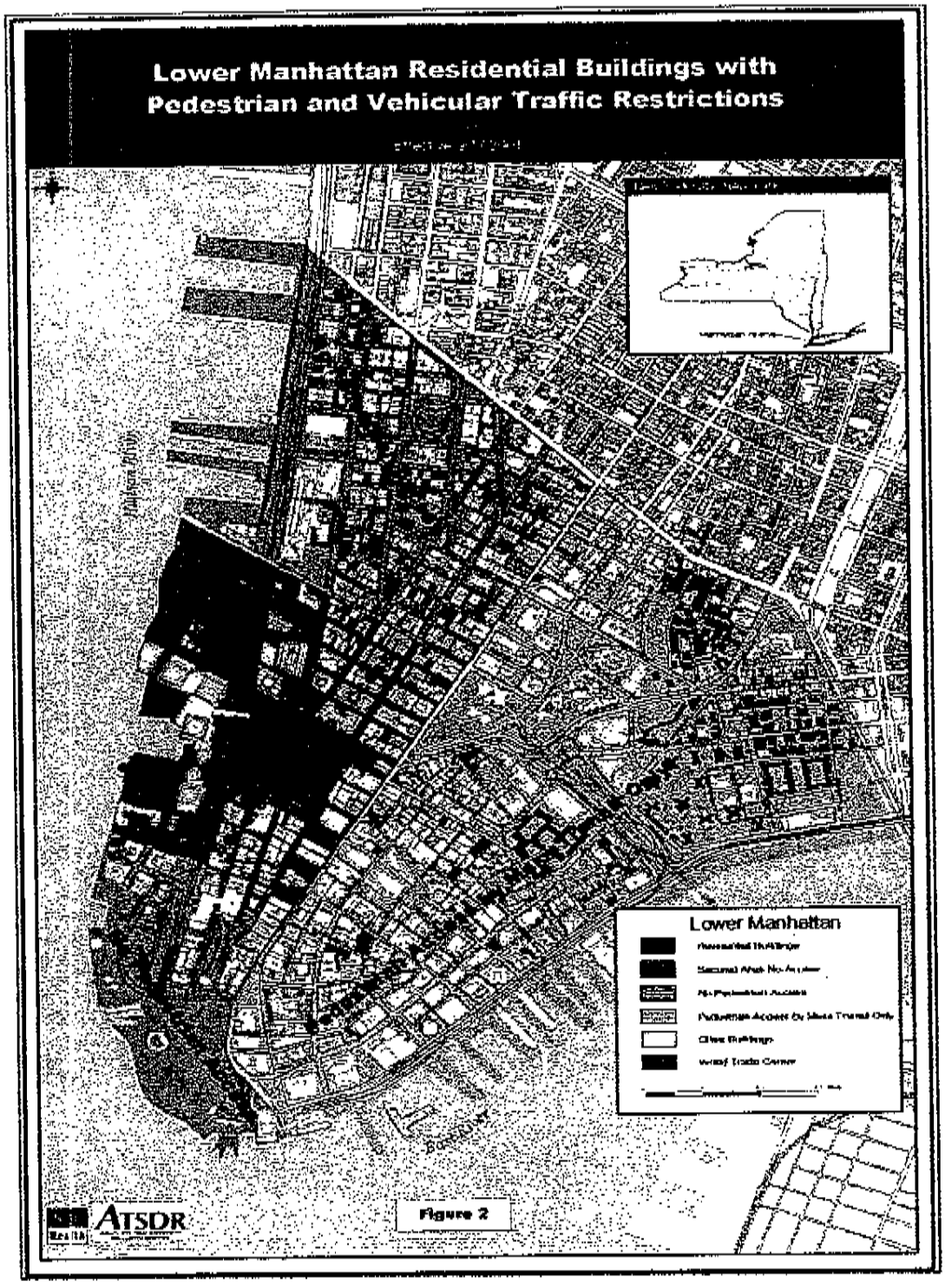
Table 12
Highest Amount of Materials Measured in the Indoor Settled Dust of Each Building

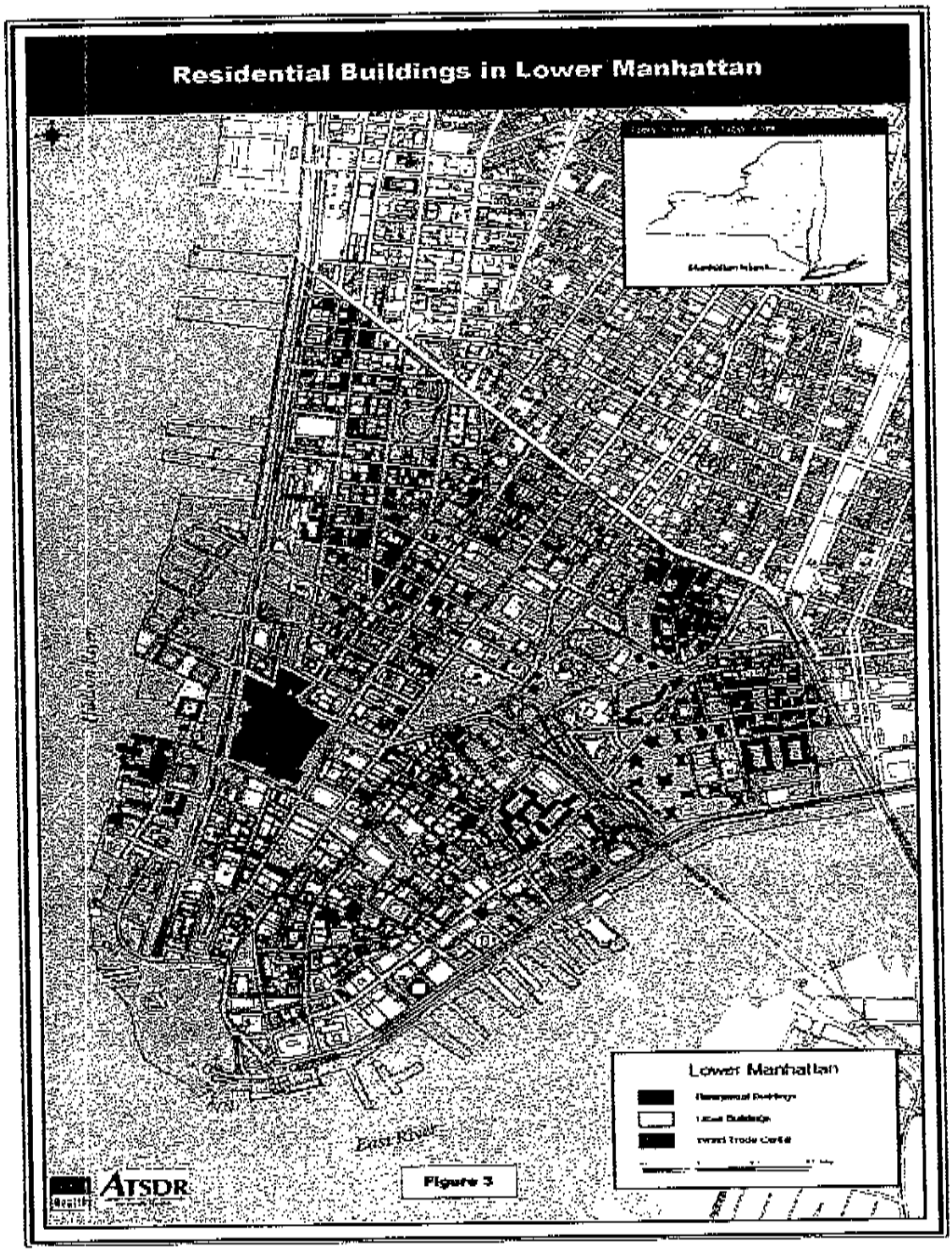
Building Number	Quartz (%) [a, d, e]	Gypsum (%) [a, d, e]	Asbestos (%) [b, f]	SVF (%) [c, f]
Comparison Locations 31-34	**2 J**	**4 J**	**Non-Detect**	**Non-Detect**
1	31 J	30 J	Non-Detect	20
2	23 J	14 J	Non-Detect	27
3	Not Sampled	Not Sampled	Not Sampled	Not Sampled
4	14 J	9 J	<1	15
5	11 J	9 J	<1	20
6	27 J	20 J	<1	15
7	21 J	15 J	Non-Detect	5
8	28 J	17 J	Non-Detect	Non-Detect
9	25 J	16 J	<1	7
10	3 J	0.8J	1.5	20
11	2 J	2 J	1.5	Non-Detect
12	4 J	1 J	Non-Detect	5
13	0.05 J	1 J	Non-Detect	10
14	0.03 J	2 J	Non-Detect	5
15	0.4 J	1 J	<1	5
16	Non-Detect	0.9 J	Non-Detect	Non-Detect
17	2 J	2 J	Non-Detect	2
18	0.9 J	1 J	Non-Detect	35
19	1 J	2 J	Non-Detect	Non-Detect
20	0.9 J	1 J	Non-Detect	Non-Detect
21	0.9 J	2 J	Non-Detect	Non-Detect
22	14 J	2 J	Non-Detect	3
23	2 J	1 J	Non-Detect	Non-Detect
24	0.03 J	Non-Detect	<1	10
25	Non-Detect	2 J	Non-Detect	5
26	0.7 J	2 J	Non-Detect	5
27	0.04 J	1 J	<1	10
28	Non-Detect	1 J	Non-Detect	10
29	1 J	2 J	Non-Detect	Non-Detect
30	1 J	4 J	Non-Detect	Non-Detect

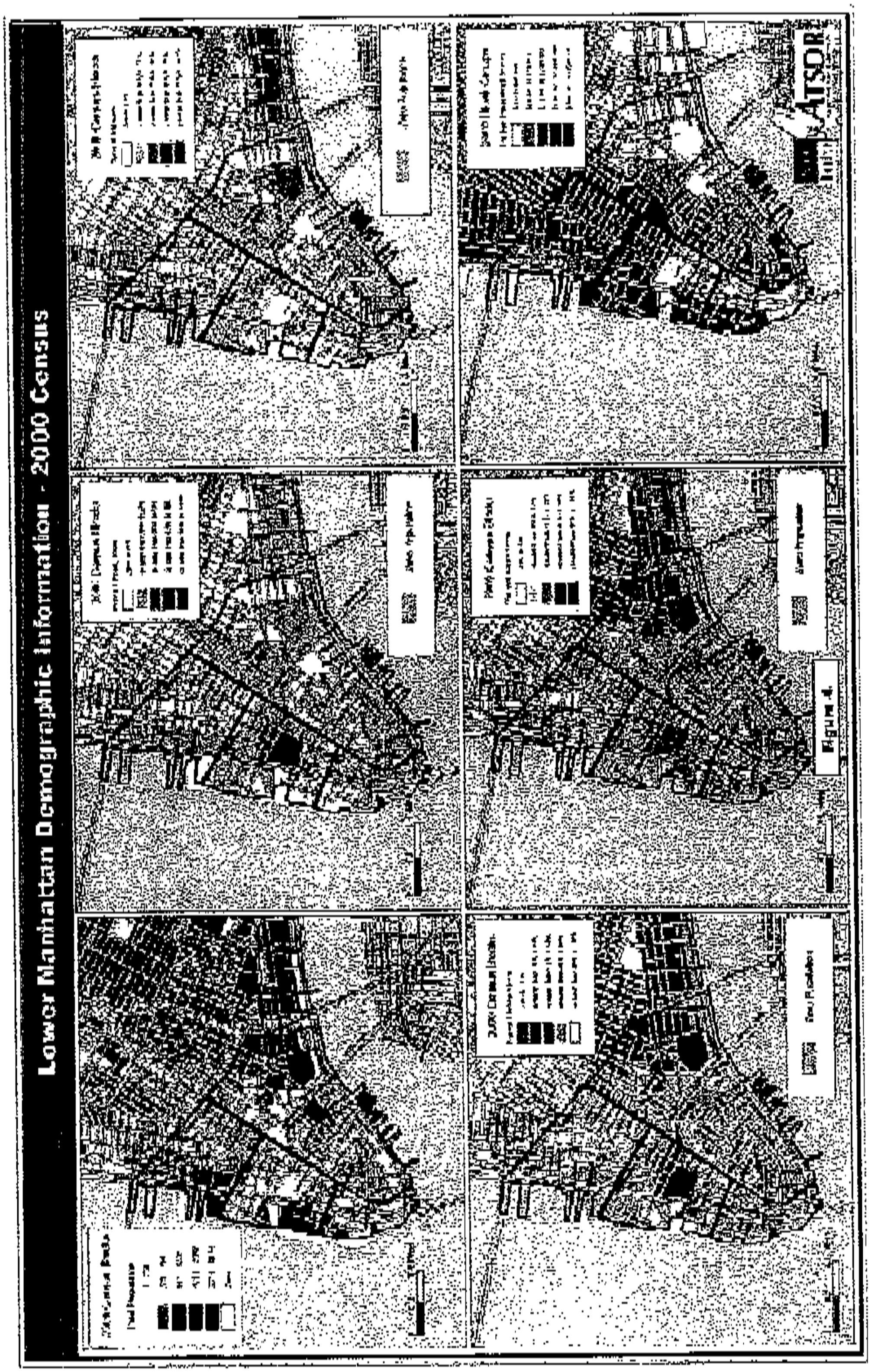
a. Minerals were measured by XRD. Quartz is considered representative of the relative presence of portlandite and calcite (all are associated with concrete).
b. Asbestos value represents the highest of the PLM and TEM result for each location.
c. SVF is synthetic vitreous fiber and was measured by PLM.
d. Results shown are estimated values, indicated by "J."
e. % = weight of mineral per weight of dust.
f. % = roughly area of fibers per area of dust.

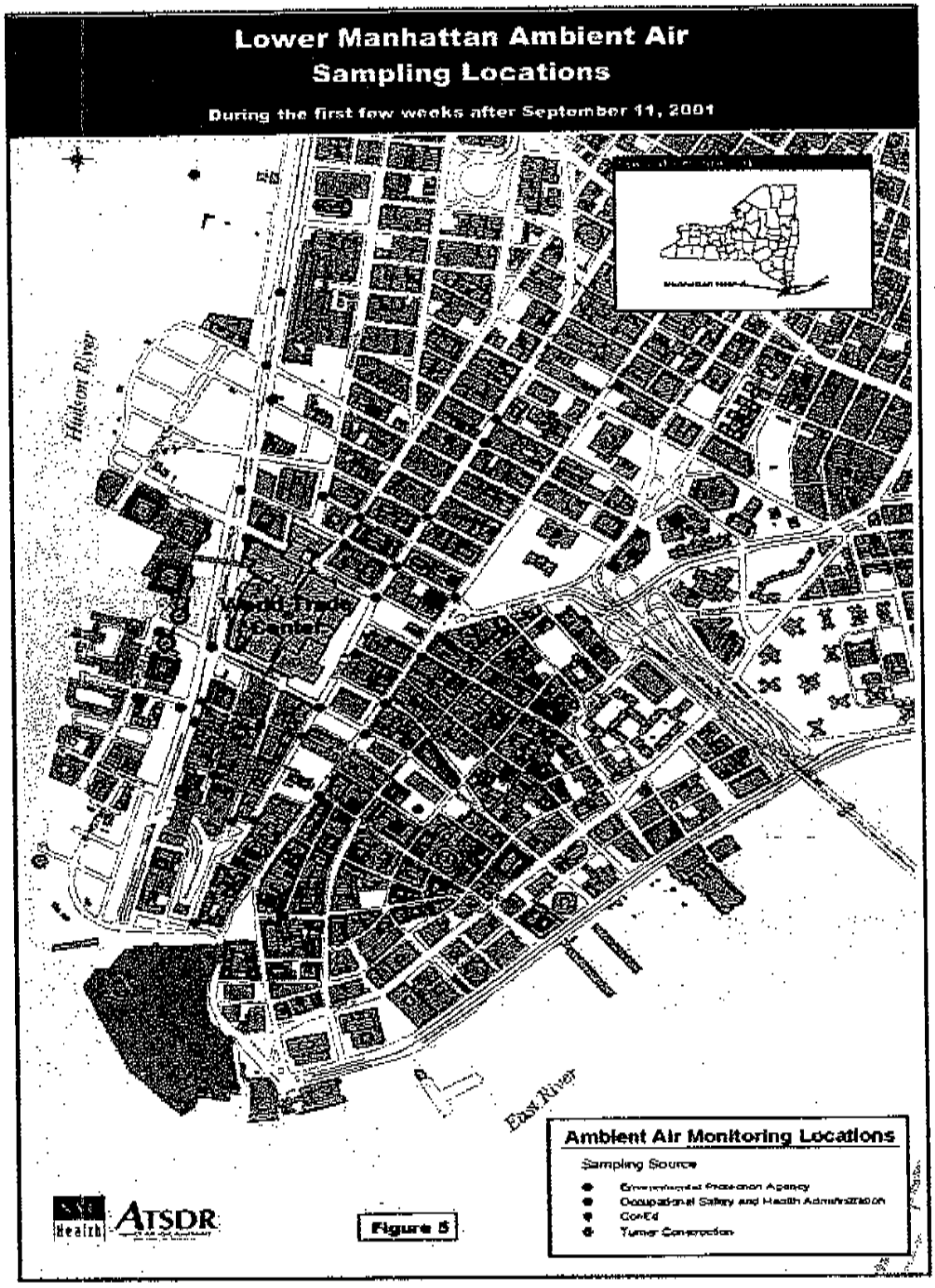
FIGURES

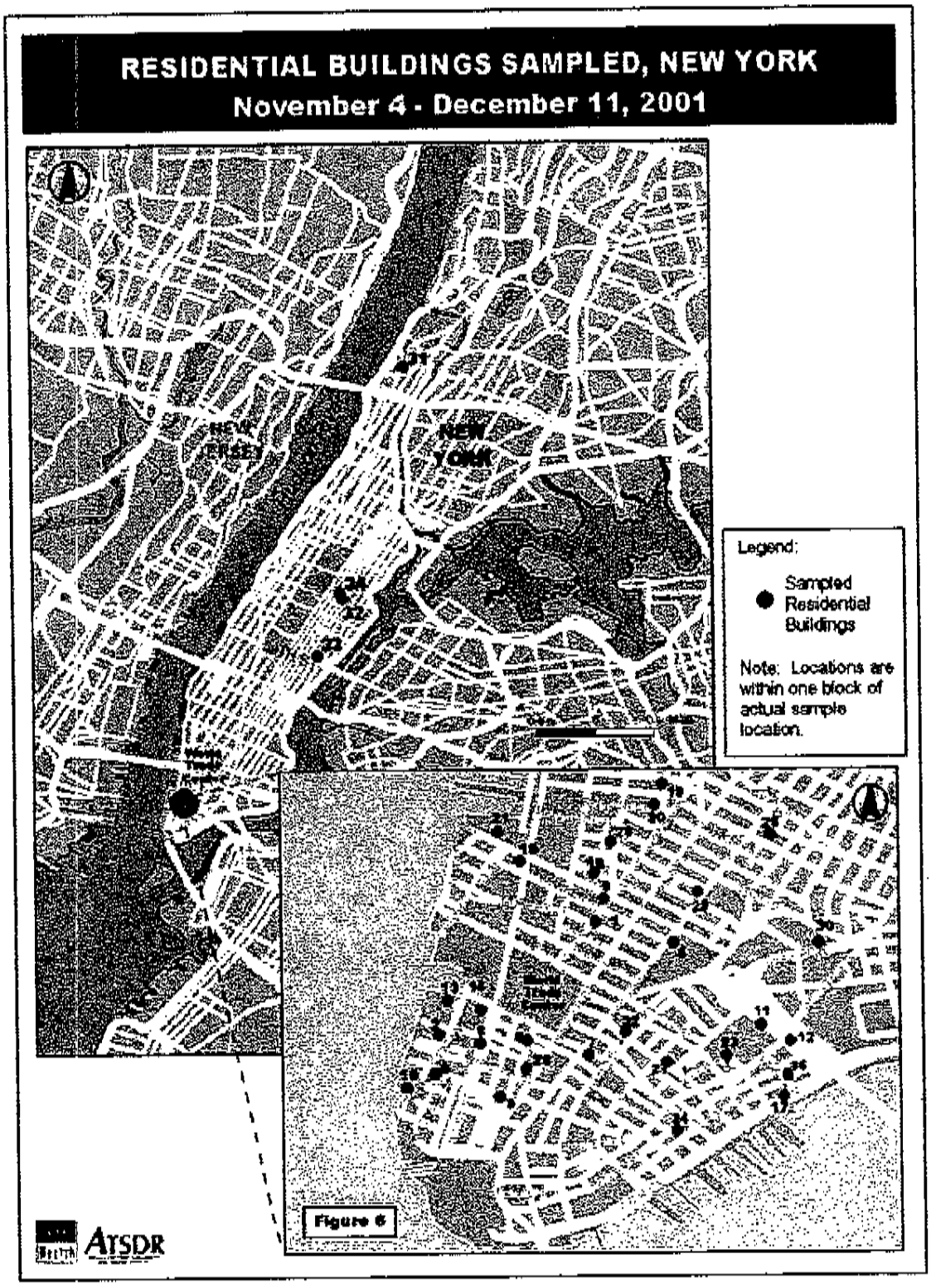

BUILDINGS DAMAGED IN LOWER MANHATTAN
September 11, 2001
N
Hudson River
BUILDING DAMAGE STATUS
Destroyed
Partially Collapsed
Major Structural Damage (no occupancy)
Damaged but stable (occupancy with repair)
ATSDR
Figure 1

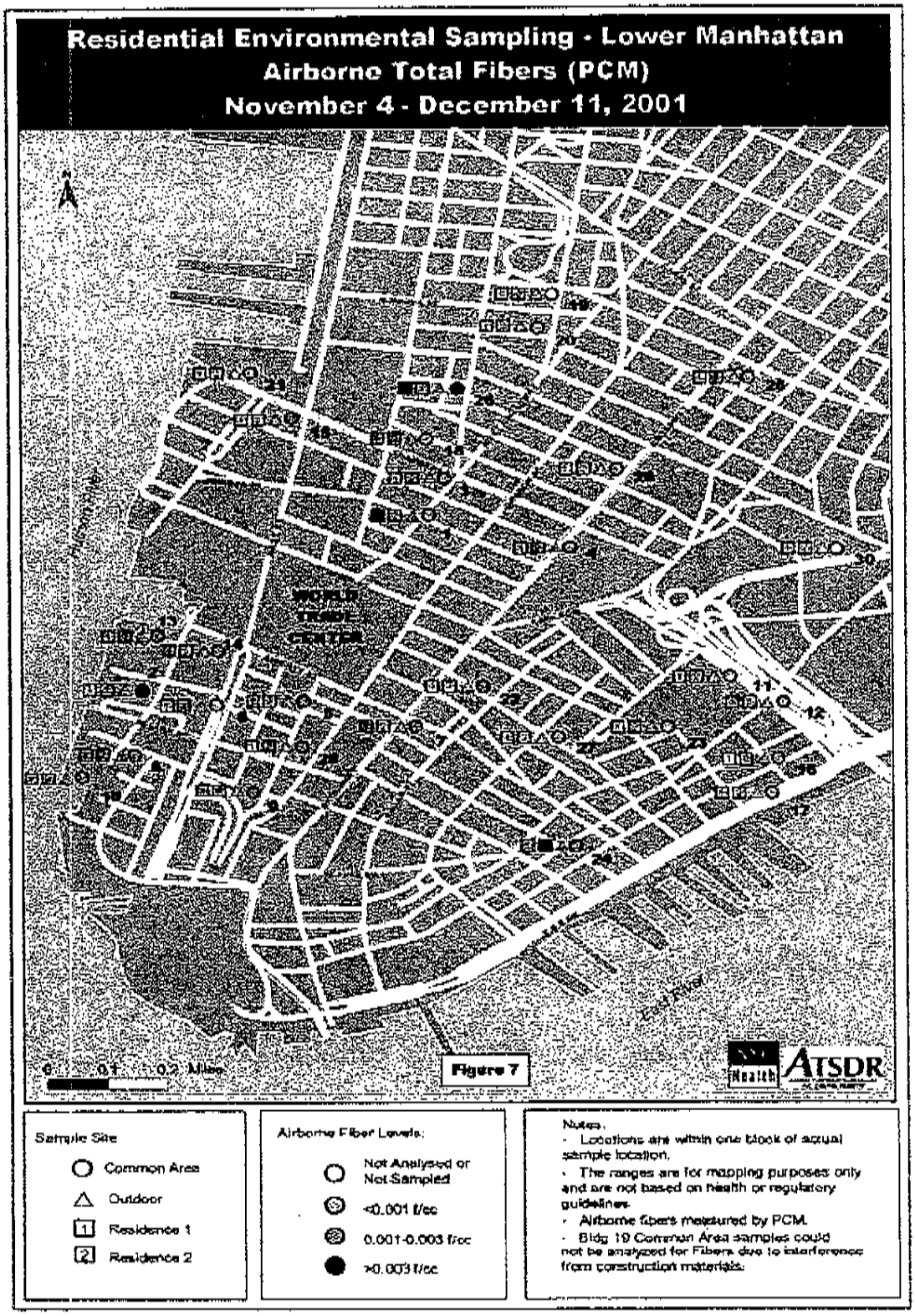

Lower Manhattan Residential Buildings with Pedestrian and Vehicular Traffic Restrictions
Lower Manhattan
ATSDR
Figure 2

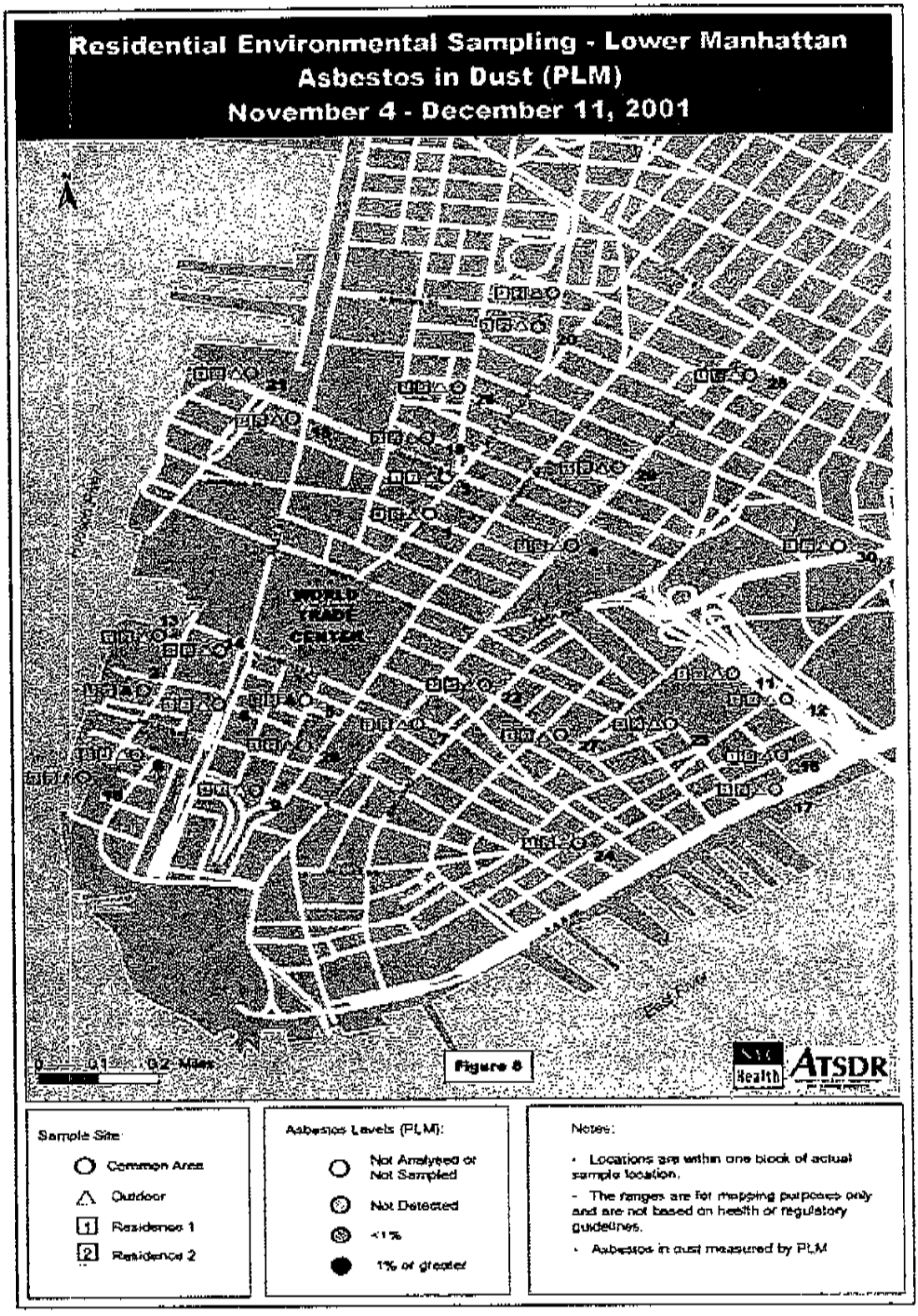

Residential Buildings in Lower Manhattan
Lower Manhattan
East River
ATSDR
Figure 3

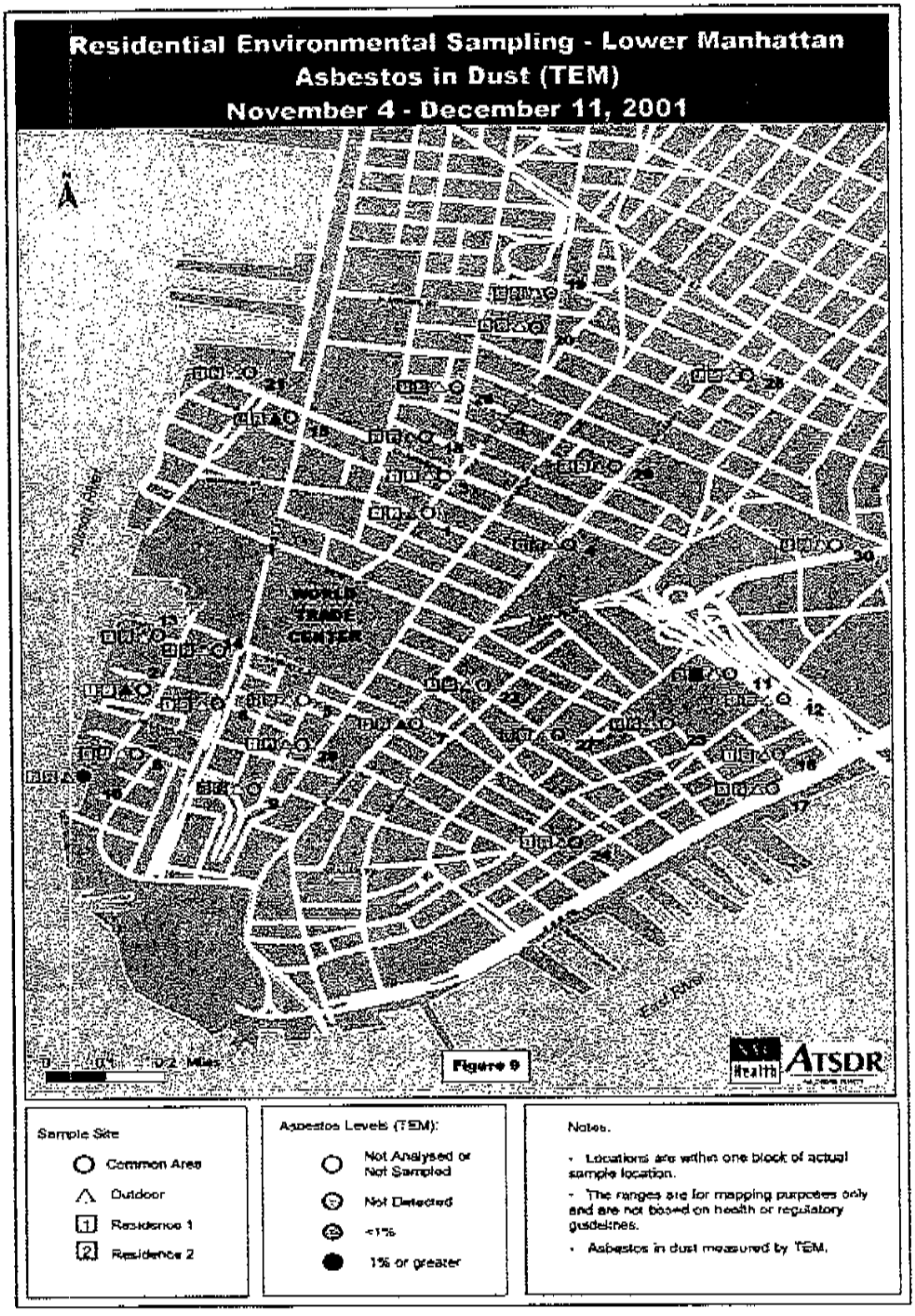

Lower Manhattan Demographic Information - 2000 Census
Figure 4

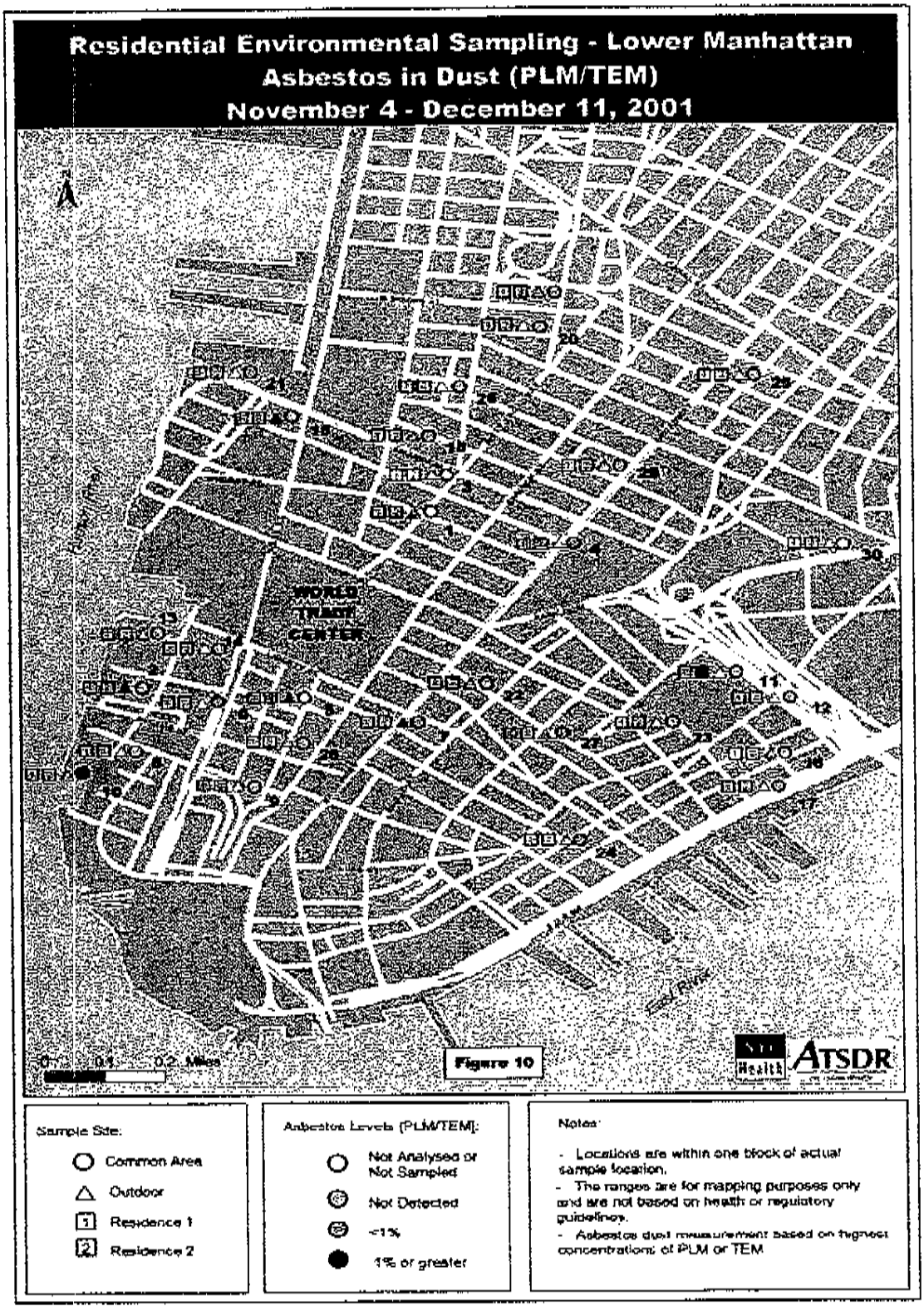

Lower Manhattan Ambient Air Sampling Locations
During the first few weeks after September 11, 2001
Hudson River
East River
Ambient Air Monitoring Locations
Sampling Source
Environmental Protection Agency
Occupational Safety and Health Administration
Con Ed
Turner Construction
Health ATSDR
Figure 5

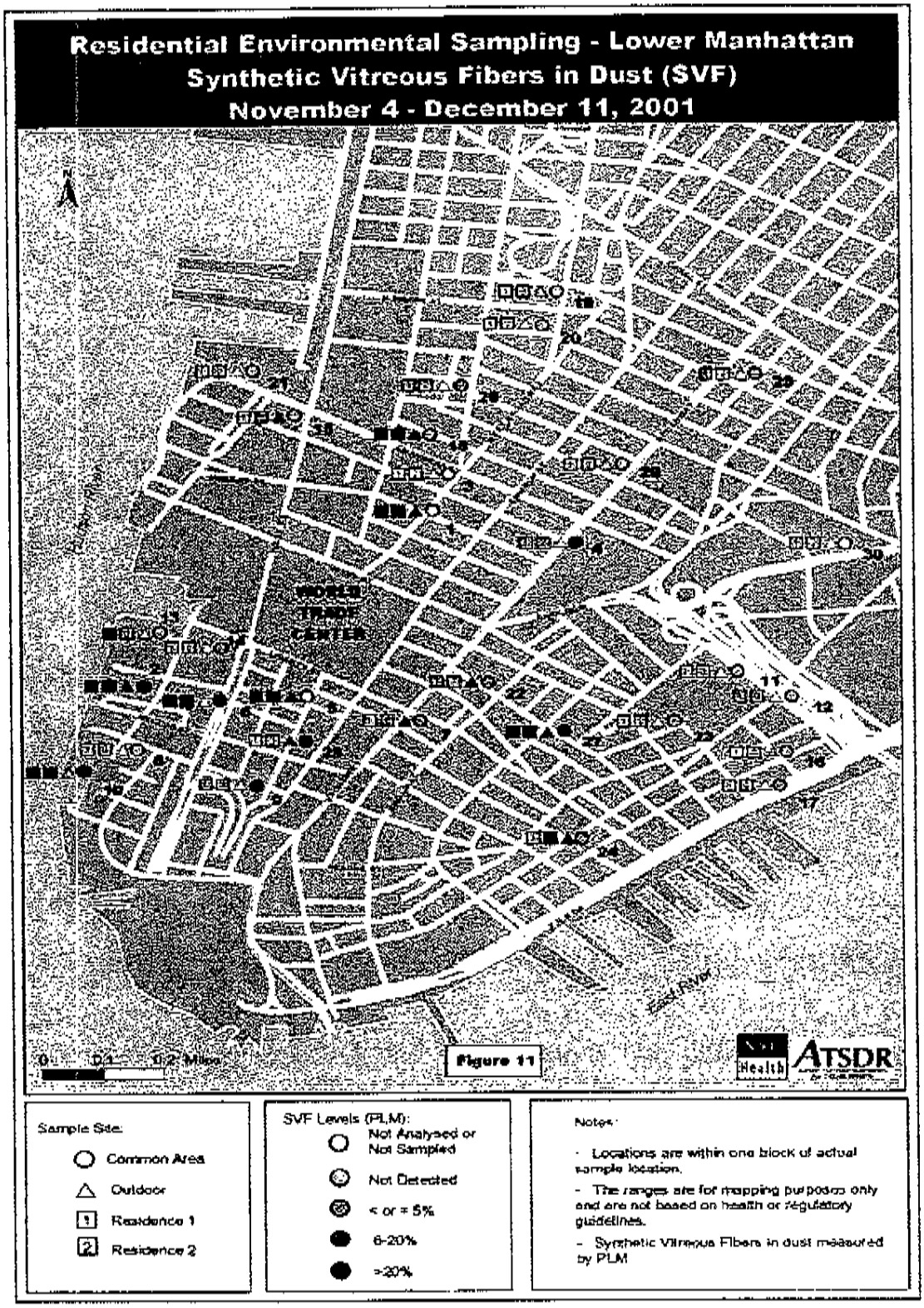

RESIDENTIAL BUILDINGS SAMPLED, NEW YORK
November 4 - December 11, 2001
NEW JERSEY
NEW YORK
Legend:
Sampled Residential Buildings
Note: Locations are within one block of actual sample location.
Figure 6
ATSDR

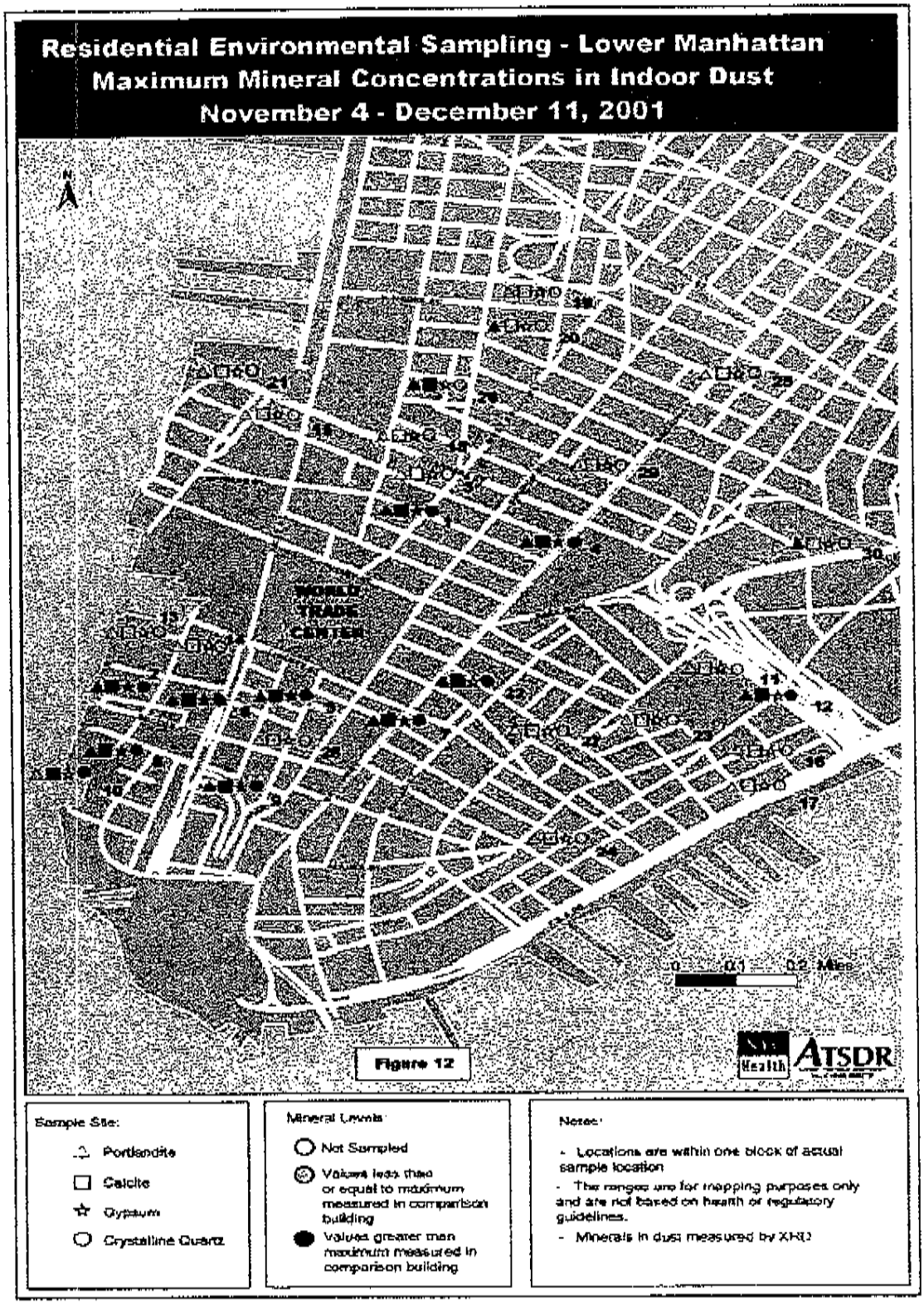

Residential Environmental Sampling - Lower Manhattan
Airborne Total Fibers (PCM)
November 4 - December 11, 2001
WORLD TRADE CENTER
0 0.1 0.2 Miles
Figure 7
ATSDR
Sample Site
Common Area
Outdoor
Residence 1
Residence 2
Airborne Fiber Levels:
Not Analysed or Not Sampled
<0.001 f/cc
0.001-0.003 f/cc
>0.003 f/cc
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Airborne fibers measured by PCM.
- Bldg 19 Common Area samples could not be analyzed for Fibers due to interference from construction materials.

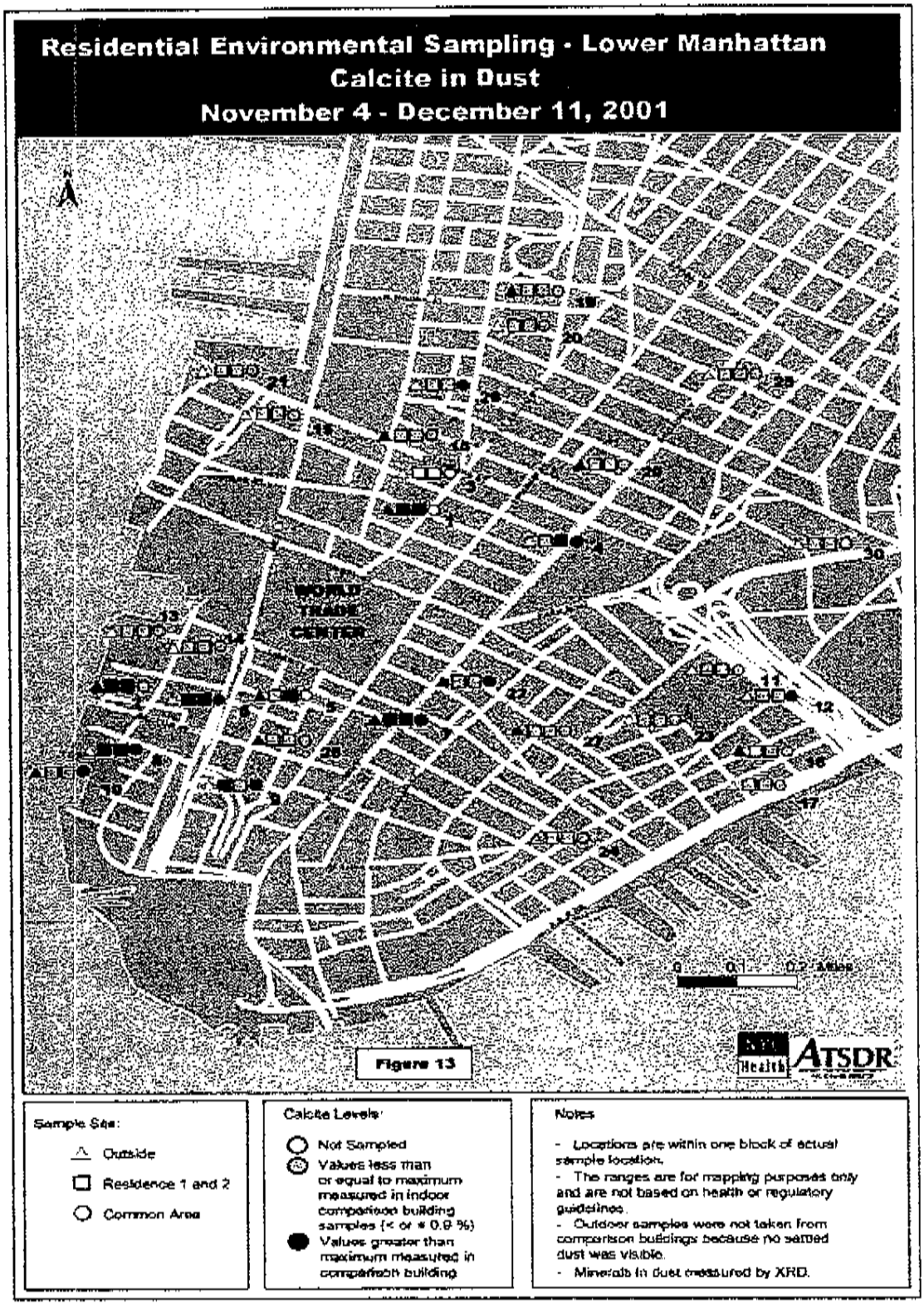

Residential Environmental Sampling - Lower Manhattan
Asbestos in Dust (PLM)
November 4 - December 11, 2001
WORLD TRADE CENTER
East River
0 0.1 0.2 Miles
Figure 8
NYC Health
ATSDR
Sample Site:
Common Area
Outdoor
Residence 1
Residence 2
Asbestos Levels (PLM):
Not Analyzed or Not Sampled
Not Detected
<1%
1% or greater
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Asbestos in dust measured by PLM

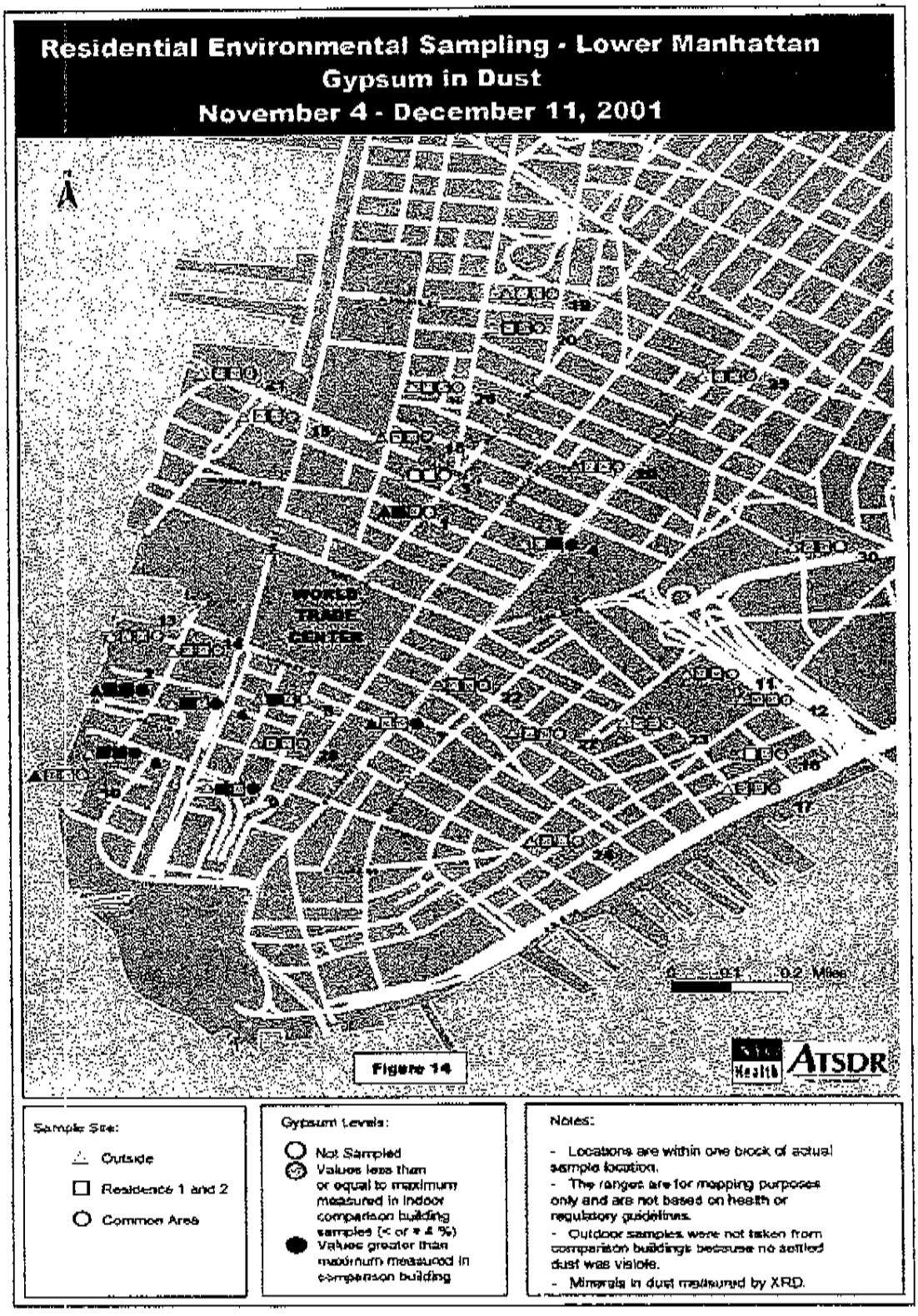

Residential Environmental Sampling - Lower Manhattan
Asbestos in Dust (TEM)
November 4 - December 11, 2001
N
Hudson River
East River
WORLD TRADE CENTER
0 0.1 0.2 Miles
Figure 9
Health ATSDR
Sample Site
Common Area
Outdoor
Residence 1
Residence 2
Asbestos Levels (TEM):
Not Analysed or Not Sampled
Not Detected
<1%
1% or greater
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Asbestos in dust measured by TEM.

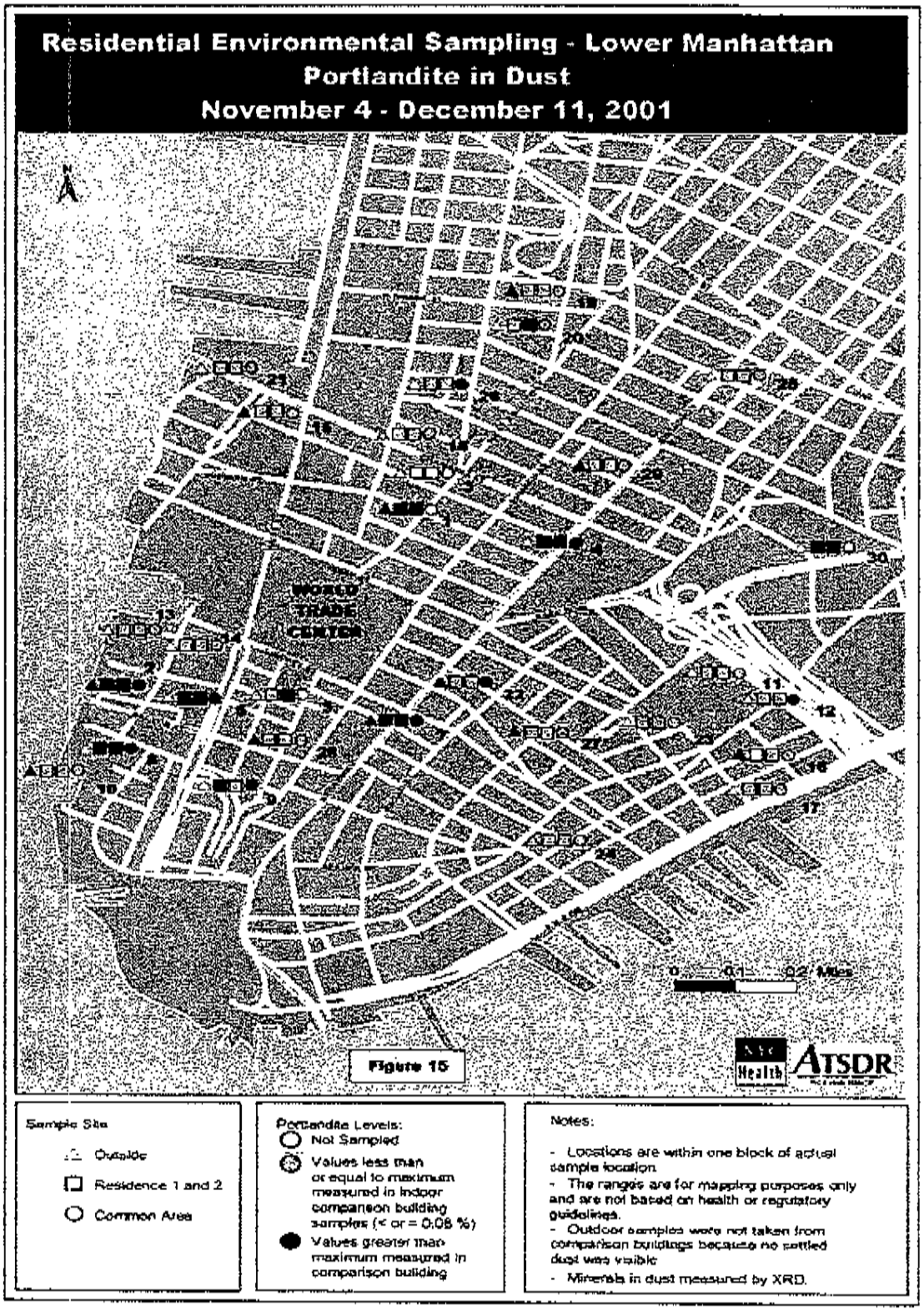

Residential Environmental Sampling - Lower Manhattan
Asbestos in Dust (PLM/TEM)
November 4 - December 11, 2001
WORLD TRADE CENTER
Figure 10
ATSDR
Sample Site:
Common Area
Outdoor
Residence 1
Residence 2
Asbestos Levels (PLM/TEM):
Not Analysed or Not Sampled
Not Detected
<1%
1% or greater
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Asbestos dust measurement based on highest concentrations of PLM or TEM

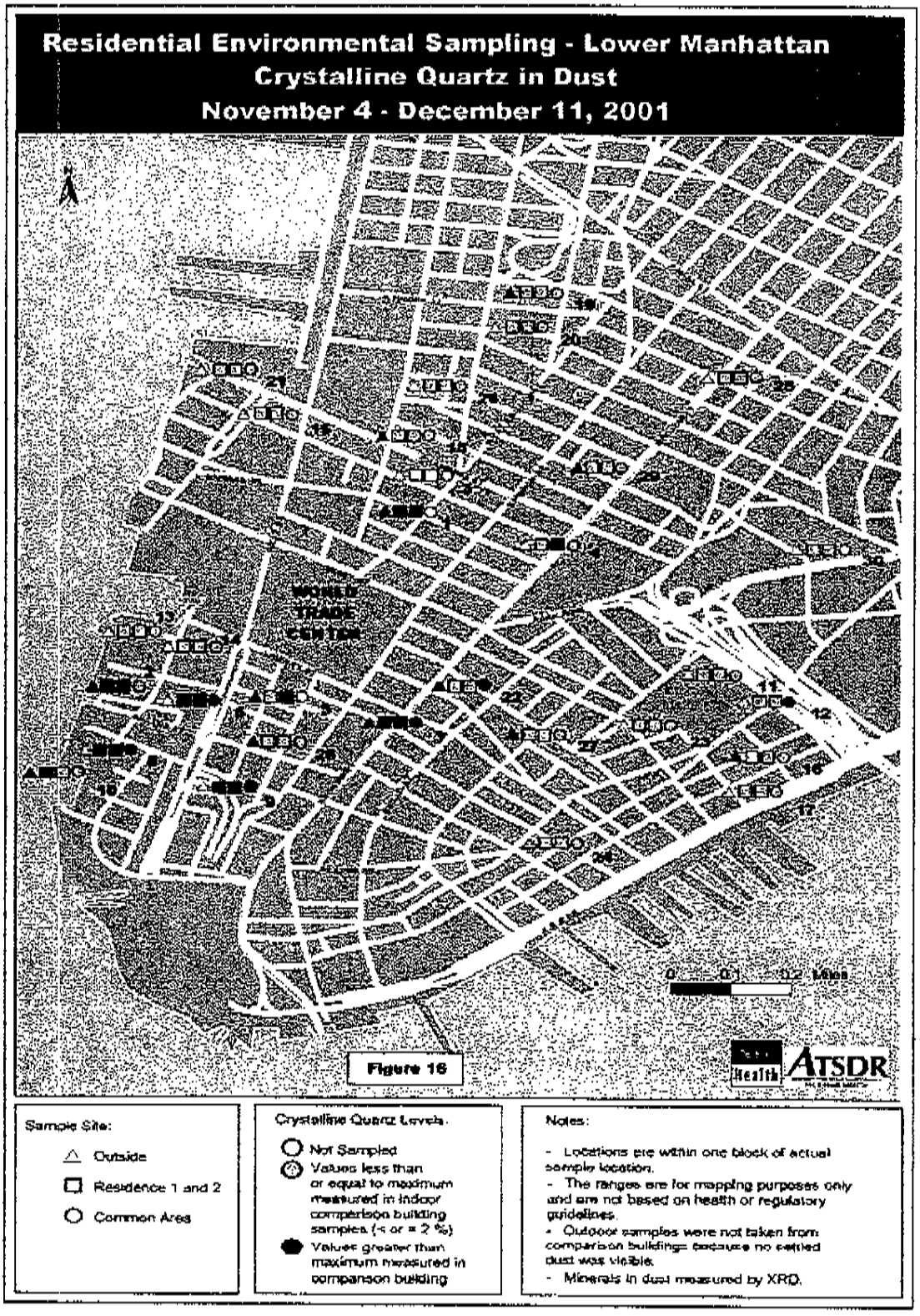

Residential Environmental Sampling - Lower Manhattan
Synthetic Vitreous Fibers in Dust (SVF)
November 4 - December 11, 2001
WORLD TRADE CENTER
Hudson River
0 0.1 0.2 Miles
Figure 11
NYC Health
ATSDR
Sample Site:
Common Area
Outdoor
Residence 1
Residence 2
SVF Levels (PLM):
Not Analyzed or Not Sampled
Not Detected
< or = 5%
6-20%
>20%
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Synthetic Vitreous Fibers in dust measured by PLM

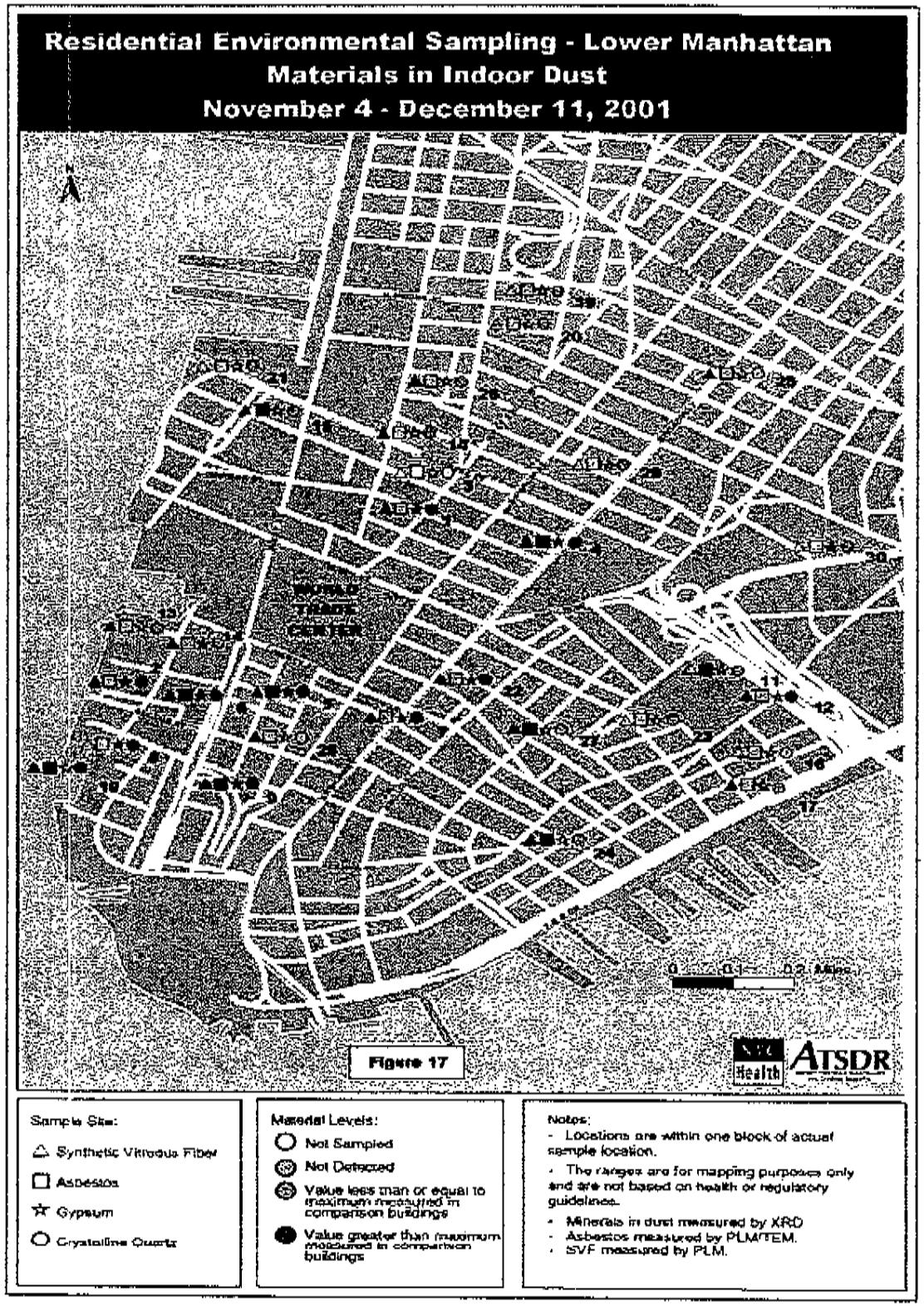

Residential Environmental Sampling - Lower Manhattan
Maximum Mineral Concentrations in Indoor Dust
November 4 - December 11, 2001
N
WORLD TRADE CENTER
0 0.1 0.2 Miles
Figure 12
ATSDR
Sample Site:
Portlandite
Calcite
Gypsum
Crystalline Quartz
Mineral Levels:
Not Sampled
Values less than or equal to maximum measured in comparison building
Values greater than maximum measured in comparison building
Notes:
- Locations are within one block of actual sample location
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Minerals in dust measured by XRD


Residential Environmental Sampling - Lower Manhattan
Calcite in Dust
November 4 - December 11, 2001
WORLD TRADE CENTER
0 0.1 0.2 Miles
Figure 13
ATSDR
Sample Site:
Outside
Residence 1 and 2
Common Area
Calcite Levels:
Not Sampled
Values less than or equal to maximum measured in indoor comparison building samples (< or = 0.9 %)
Values greater than maximum measured in comparison building
Notes
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Outdoor samples were not taken from comparison buildings because no settled dust was visible.
- Minerals in dust measured by XRD.


Residential Environmental Sampling - Lower Manhattan
Gypsum in Dust
November 4 - December 11, 2001
WORLD TRADE CENTER
0.1
0.2 Miles
Figure 14
NYC Health
ATSDR
Sample Site:
Outside
Residence 1 and 2
Common Area
Gypsum Levels:
Not Sampled
Values less than or equal to maximum measured in indoor comparison building samples (< or = 4 %)
Values greater than maximum measured in comparison building
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Outdoor samples were not taken from comparison buildings because no settled dust was visible.
- Minerals in dust measured by XRD.


Residential Environmental Sampling - Lower Manhattan
Portlandite in Dust
November 4 - December 11, 2001
N
WORLD TRADE CENTER
0
0.1
0.2 Miles
Figure 15
ATSDR
Sample Site
Outside
Residence 1 and 2
Common Area
Portlandite Levels:
Not Sampled
Values less than or equal to maximum measured in indoor comparison building samples (< or = 0.08 %)
Values greater than maximum measured in comparison building
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Outdoor samples were not taken from comparison buildings because no settled dust was visible.
- Minerals in dust measured by XRD.


Residential Environmental Sampling - Lower Manhattan
Crystalline Quartz in Dust
November 4 - December 11, 2001
WORLD TRADE CENTER
0 0.1 0.2 Miles
Figure 16
Health
ATSDR
Sample Site:
Outside
Residence 1 and 2
Common Area
Crystalline Quartz Levels:
Not Sampled
Values less than or equal to maximum measured in indoor comparison building samples (< or = 2 %)
Values greater than maximum measured in comparison building
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Outdoor samples were not taken from comparison buildings because no settled dust was visible.
- Minerals in dust measured by XRD.


Residential Environmental Sampling - Lower Manhattan
Materials in Indoor Dust
November 4 - December 11, 2001
Figure 17
ATSDR
Sample Site:
Synthetic Vitreous Fiber
Asbestos
Gypsum
Crystalline Quartz
Material Levels:
Not Sampled
Not Detected
Value less than or equal to maximum measured in comparison buildings
Value greater than maximum measured in comparison buildings
Notes:
- Locations are within one block of actual sample location.
- The ranges are for mapping purposes only and are not based on health or regulatory guidelines.
- Minerals in dust measured by XRD
- Asbestos measured by PLM/TEM.
- SVF measured by PLM.

SAMPLING EVENT PHOTOGRAPHS

Photo 1. Residential Vacuum Sample

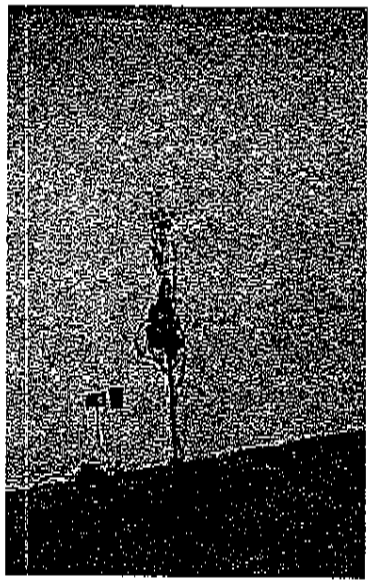


Photo 2. Residential Air Sampling

Photo 3. Residential Air Sampling

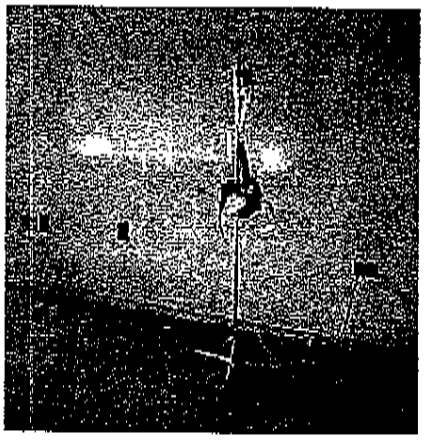


Photo 4. Residential Air Sampling

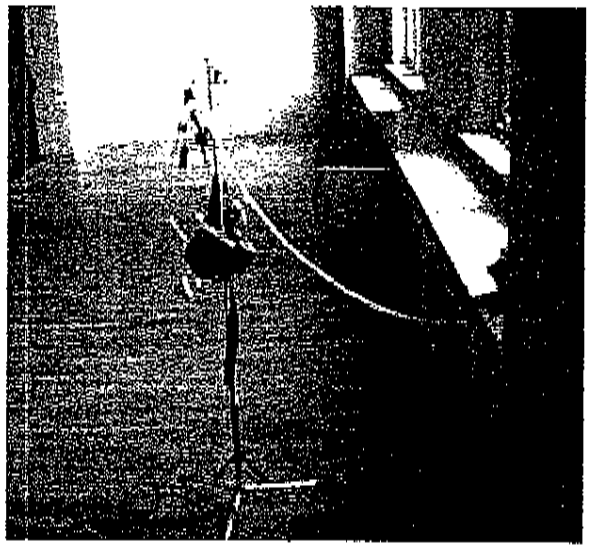


Photo 5. Residential Air Sampling

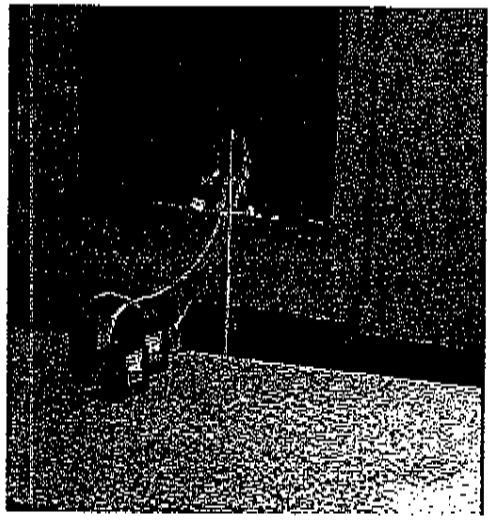


Photo 6. Residential Air Sampling

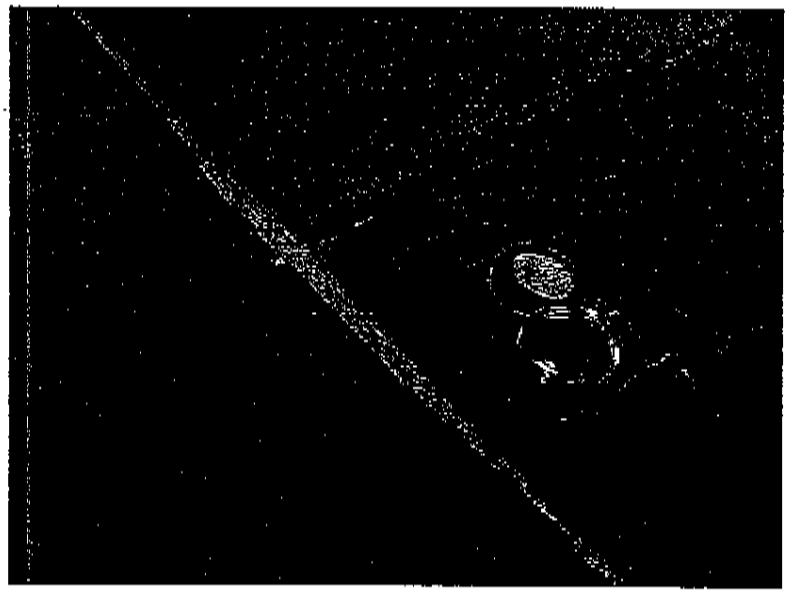


Photo 7. Outside Bulk Sampling

Photo 8. Sampling Head

APPENDICES

Appendix A. Particulate Matter Quality Assurance/Quality Control Discussion

General Notes on Quality Assurance/Quality Control Procedures

Quality assurance/quality control (QA/QC) procedures are used to ensure the precision, accuracy, completeness, representativeness, comparability, and method detection limit of the results. The co-located samples and blanks are a primary means of assessing each of the data quality indicators. Comparing the results of two co-located samples provides information on the precision of the results as a whole. Comparing sample results to their associated blanks can help identify some potential errors in accuracy. Comparing the results received to those expected and necessary to draw conclusions about the data can help in understanding the completeness and reliability of the results. Comparability can be assessed by looking at the results taken from different sampling locations of the same building—or from different buildings for the same type of location. The reviews are generally qualitative and provide a qualitative assessment of how well the data actually represents the sampled location.

The method detection limit is a more quantitative review. It is accomplished by calculating the lowest result the analytical method can accurately identify. It is based on an analysis of the blank samples and is specific for the sampling/analysis method. Reliable information can only be obtained from sample results with method detection limits significantly lower than the average value of the results and significantly lower than any comparison values to which the sample results will be compared.

The analytical results of the concentration of airborne particulate matter were provided by the laboratory as the initial weight of the filter prior to the sampling event and the final weight of the filter after the sampling event. The concentration of the particulate matter was calculated by dividing the weight of the material collected on the filter by the volume of air drawn through the filter by the pump using the following formulas.

Weight Gain of Filter = Final Weight - Initial Weight

Sample Volume = Average Pump Flow Rate × Sample Collection Time

Average Air Sampling Pump Flow Rate=(Presampling Flow Rate + Postsampling Flow Rate) ÷ 2

Concentration = Weight Change ÷ Sample Volume

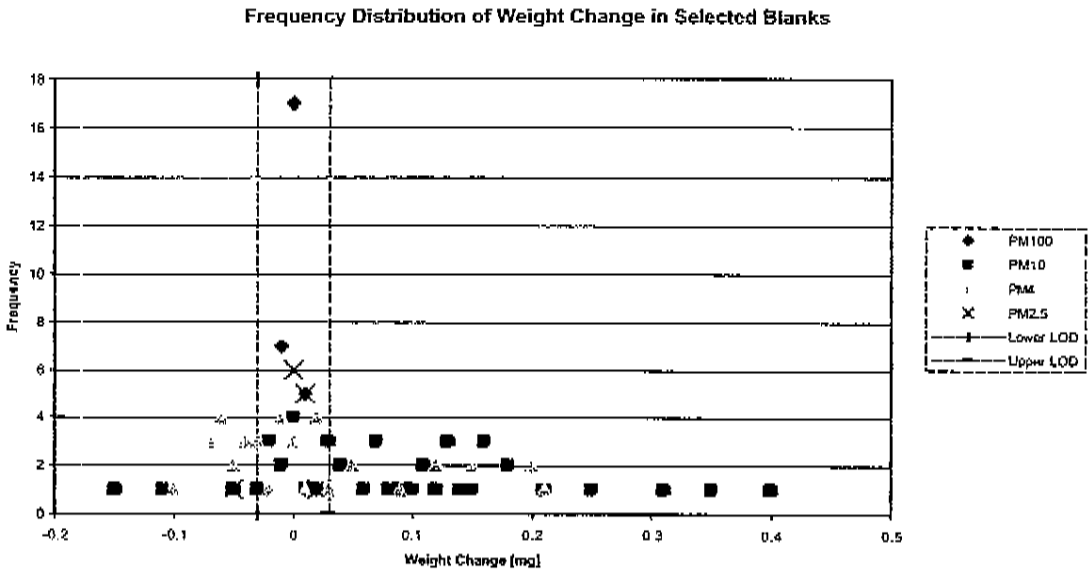
Airborne Particulate Matter Sample Results

Each area that was sampled for airborne asbestos was also sampled for airborne particulate matter (PM). The sample results from the PM measurements did not meet the data QA/QC objectives. A variety of statistical and graphical analyses were performed on, and with, the measured results in an attempt to identify the cause and extent of inconsistencies of the measured results. A subset of the measured results that are not potentially affected by these inconsistencies were not identified. Therefore, the entire data set describing airborne particulate matter concentrations was rejected. In addition, the specific cause of the inconsistencies was not identified. The following information explains why the airborne particulate matter results were rejected.

Ideally, the particulate matter data would have provided information about the airborne concentration with an aerodynamic diameter of 100 microns and less (PM100), of 10 microns and less (PM10), of 4 microns and less (PM4), and of 2.5 microns and less (PM2.5). These different size fractions (PM100, PM10, PM4, and PM2.5) are collected using slightly different equipment, but following the same basic procedures. A pump draws air into a sampling head, and size specific particulate matter is deposited onto a filter. The difference in filter weight, before and after the sampling, represents the mass of the particulate matter that was captured by the filter. Knowing the presampling and postsampling air flow rates of the pump and the time duration for sample collection allows us to calculate the average volume of air that was drawn through the filter. The concentration of the size fraction in the sampled air is then calculated by dividing the PM mass by the air volume sampled.

In addition to the filters that were used to measure the concentration of airborne particulate matter, the laboratory also sent filters to be used as field blanks. Two blanks were sent for each PM fraction for each of the two sampling teams for each building. The blanks traveled with the sample filters, went to the sampled building or area, and were treated just like the sample filters—except that they were not used. Ideally, there should be very little difference in the weight of the blanks before the sampling and after the sampling because they were not used. A weight gain in field blanks may indicate improper sample handling in the field or problems in filter weighing in the lab. For the latter a decrease in post field blank filter weight is also an indication of lab weighing error.

The graph shown with this discussion shows the frequency distribution of the air sample filter weight change in all but seven of the blanks used. Seven blanks were not included because their weight change (from a negative -90 milligrams (mg) to 5.99 mg) was greater than the limits shown in this graph (-0.2 mg to 0.5 mg). The vertical axis represents the number of blanks that had a weight change within 0.01 mg of the weight change shown on the horizontal axis.



The dashed vertical lines show the upper and lower limits of detection expected for this method (+/– 0.03 mg). The distance between limits of detection represents the maximum weight gain expected for the blanks if the entire sampling procedure was followed as required by standard sampling methodologies. All of the size fractions had at least two blanks outside the limit of detection boundaries. (The two out of range blanks for PM100 are not shown on the graph because they are also beyond the boundaries of the graph). Approximately 6% of the PM100, 70% of the PM10, 57% of the PM4, and 8% of the PM2.5 blanks had weight changes greater than the limit of detection.

In general, blanks are used (1) to assess the ability of the sampling and laboratory analysis methodology to accurately estimate the concentration of particulate matter in the air at the sampled location and (2) to validate that there is no filter contamination problem from the time the blanks are initially weighed in the laboratory until the time the blanks are weighed in the laboratory after sampling. Errors could occur at any step in the process.

The large weight change of the blanks indicates errors in either the laboratory weighing process or the air sampling process. The graph illustrates that the results of the airborne particulate matter sampling cannot be used to reliably estimate the actual concentration of any of the particulate matter size fractions; therefore, the entire data set was rejected from further consideration.

Appendix B. Survey Result

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust in Photo	Photo Comments
1	Outside	28						None Visible	
1	Common	0	SI	N		C		None Visible	Prepared for asbestos abatement
1	Residence 1	2	LI	Y	U	None	N	Large Amount	Large amount of WTC dust; more than other locations sampled
1	Residence 2	0	NI	N	U	None	Y	None Visible	
2	Outside	1		Y				None Visible	
2	Common	0	NI	N		C		Slight Amount	
2	Residence 1	0	SI	N	Y	C	N	None Visible	Residence window faces WTC site
2	Residence 2	0	SI	N	U	C	Y	None Visible	
3	Outside	0		N				None Visible	Sampled from courtyard several floors up
3	Common	0	LI	N		AA		None Visible	
3	Residence 1	0	LI	N	Y	AA	N	None Visible	
3	Residence 2	0	MI	N	Y	C	N	None Visible	
4	Outside	0		N				Slight Amount	
4	Common	0	NI	Y		O		None Visible	
4	Residence 1	0	SI	Y	N	None	Y	None Visible	
4	Residence 2	0	SI	Y	N	None	Y	None Visible	
5	Outside	50		Y				Large Amount	
5	Common	0	SI	N		AA		None Visible	
5	Residence 1	6	LI	LI	Y	AA	Y	None Visible	
5	Residence 2	6	LI	LI	Y	AA	Y	None Visible	Room looks clean but lots of WTC dust outside one window sill
6	Outside	200		N				None Visible	
6	Common	0	SI	N		C			Couldn't identify photos for common area
6	Residence 1	0	LI	N	U	C	Y	None Visible	
6	Residence 2	0	SI	N	U	C	Y	None Visible	
7	Outside	2		N				None Visible	
7	Common	0	MI	N		C		None Visible	Many window sills (not sure where) have significant amount of WTC dust on outside ledge, not noticeable on inside of window.
7	Residence 1	0	MI	N	Y	C	N	None Visible	
7	Residence 2	0	MI	N	Y	C	N	None Visible	Resident has window view of WTC site

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust in Photo	Photo Comments
8	Outside	0		N				None Visible	
8	Common	0	MI	N		C		None Visible	
8	Residence 1	1	SI	N	Y	O	N	None Visible	
8	Residence 2	1	MI	N	Y	C	N	None Visible	Resident has window view of WTC site
9	Outside	2		N				None Visible in Picture	Utility/road construction occurring near building and across the street from the front door.
9	Common	0	LI	N		C		None Visible	
9	Residence 1	0	MI	Y	Y	C	Y	None Visible	
9	Residence 2	0	MI	Y	Y	C	Y	Slight Amount	
10	Outside	0		Y				Slight Amount	
10	Common	0	SI	N		AA		None Visible	
10	Residence 1	0	NI	N	Y	AA	Y	None Visible	View of Statue of Liberty
10	Residence 2	1	SI	N	Y	AA	Y	None Visible	
11	Outside	0	LI	N				None Visible	Looks like many dried, fallen leaves on sidewalk
11	Common	0	SI	N		MS		None Visible	
11	Residence 1	0	SI	N	V	None	Y	None Visible	
11	Residence 2	0	UNK	N	V	UNK	Y	None Visible	Wall AC unit was removed, it was just a hole to the outside
12	Outside	0		N				None Visible	Looks like many dried, fallen leaves on sidewalk
12	Common	0	SI	N		MS		None Visible	
12	Residence 1	0	MI	Y	V	None	N	Large Amount	Very messy, doesn't look like "WTC dust" (has "post-move-out" look)
12	Residence 2	0	SI	N	V	None	Y	None Visible	
13	Outside	0		N				Slight Amount	A little messy, but does not look like WTC dust
13	Common	0	MI	N		MS		None Visible	
13	Residence 1	0	MI	N	V	C	Y	None Visible	
13	Residence 2	0	MI	Y	V	C	Y	Large Amount	Very messy, but not with WTC dust (post-move-out look)
14	Outside	0		N				None Visible	Air sample from garden area; no bulk sample taken; WTC dust visible on neighboring building.
14	Common	0	SI	N		C		None Visible	
14	Residence 1	0	MI	Y	U	None	Y	Large Amount	Light dust on floors; one pile of "material," could be from remodeling activity

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust In Photo	Photo Comments
14	Residence 2	0	MI	Y	U	None	Y	None Visible	Pile of trash swept into center of room; no WTC dust
15	Outside	0		N				None Visible	Bulk sample from roof top courtyard,
15	Common	0	SI	Y		MS		None Visible	Dust visible in (and sampled from) cracks between tiles.
15	Residence 1	0	SI	Y	U	O	Y	None Visible	
15	Residence 2	0	SI	N	U	O	Y	None Visible	
16	Outside	0		N				None Visible	
16	Common	0	MI	N		C		None Visible	
16	Residence 1	0				MS		None Visible	
16	Residence 2	0	LI	N	Y	O	N		No picture
17	Outside	0		N				Slight Amount	Dirty/messy, but doesn't look like WTC dust
17	Common	0	SI	Y		C		None Visible	
17	Residence 1	0	SI	N	Y	C	N	None Visible	
17	Residence 2	0	MI	Y	U	C	Y	Slight Amount	
18	Outside	0		N				M	Sample looks granular and sandy, not gray like WTC dust
18	Common	0	LI	N		MS		None Visible	Leaf track-in visible
18	Residence 1	0	MI	N	Y	C	N	None Visible	Window view of WTC site
18	Residence 2	0	LI	N	Y	C	N	None Visible	
19	Outside	0		N				Moderate	Visible in, and sampled from, sidewalk joint with building; sidewalk looked cleaner.
19	Common	0	SI	N		C		None Visible	
19	Residence 1	0	LI	N	Y	O	N	None Visible	
19	Residence 2	0	NI	N	Y	O	N		No picture
20	Outside	0		N				Unk	Too distant to see surface dust
20	Common	0	SI	N		MS		None Visible	
20	Residence 1	0	NI	N	Y	O	N	None Visible	
20	Residence 2	0	SI	N	Y	O	N		No picture
21	Outside	0		N				None Visible	
21	Common	0	SI	N		C		None Visible	
21	Residence 1	0	SI	N	Y	C	N	None Visible	
21	Residence 2	0	NI	N	Y	C	N	None Visible	

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust in Photo	Photo Comments
22	Outside	8		Y				None Visible	Sidewalk/entrance to building and roof courtyard look clean, but there is a pile of material to sample on roof; location is unknown.
22	Common	1	LI	N		C		None Visible	
22	Residence 1	0	MI	Y	Y	MS	N	None Visible	
22	Residence 2	0	LI	N	Y	C	N	None Visible	
23	Outside	0		N				None Visible	
23	Common	0	SI	N		C		None Visible	
23	Residence 1	0	MI	Y	Y	O	N	None Visible	
23	Residence 2	0	MI	N	Y	O	N	None Visible	
24	Outside	0		N				None Visible	
24	Common	0	LI	N		MS		None Visible	
24	Residence 1	0	SI	N	Y	O	N	None Visible	
24	Residence 2	0	SI	N	Y	C	N	None Visible	
25	Outside	0		N				None Visible	
25	Common	0	NI	N		MS		None Visible	
25	Residence 1	0	NI	N	Y	O	N	None Visible	
25	Residence 2	0	SI	N	Y	C	N	None Visible	
26	Outside	0		N				None Visible	
26	Common	0	NI	N		MS		None Visible	Floor area sampled contained some broken tiles.
26	Residence 1	0	NI	N	Y	O	N	None Visible	
26	Residence 2	0	SI	N	Y	O	N	None Visible	
27	Outside	0		N				None Visible	
27	Common	0	MI	N		MS		None Visible	
27	Residence 1	0	LI	N	Y	C	N	None Visible	
27	Residence 2	0	SI	N	Y	C	N	None Visible	
28	Outside	0						None Visible	Bulk sample from 4-inch wide strip between two different tiled areas; thick with granular/dusty/other material, not sure if any is WTC.
28	Common	0	LI	Y		C		None Visible	
28	Residence 1	3	LI	N	U	C	N	None Visible	
28	Residence 2	0	MI	N	U	C	N	None Visible	
29	Outside	0		N				None Visible	Bulk sample from small pile at an inside corner of the building wall

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust in Photo	Photo Comments
29	Common	0	NI	N		C		None Visible	
29	Residence 1	0	SI	N	Y	O	N	None Visible	
29	Residence 2	0	SI	Y	Y	O	N	None Visible	
30	Outside	0							No picture
30	Common	0							No picture
30	Residence 1	0	SI	N	Y	O	N	None Visible	
30	Residence 2	0	MI	N	Y	C	N	None Visible	
31	Outside	0						None Visible	
31	Common	0	NI	N		MS		None Visible	
31	Residence 1	0	NI	N	N	MS	Y	None Visible	
31	Residence 2	0	NI	UNK	Y	O	N	None Visible	
32	Outside	0						None Visible	Trash visible on sidewalk
32	Common	0	NI	N		MS		None Visible	
32	Residence 1	0	NI	N	Y	O	N	None Visible	
32	Residence 2	0							
33	Outside	0						None Visible	
33	Common	0							
33	Residence 1	0							
33	Residence 2	0	NI	Y	Y	O	N	None Visible	
34	Outside	0		N				None Visible	
34	Common	0	NI	N		MS		None Visible	
34	Residence 1	0							
34	Residence 2	0	UNK	N	Y	O	N	None Visible	

Summary of Residential Sampling Survey Form Results and Review of Photographs
(Abbreviations and terms used in the table are defined on the last page in this table.)

Event Number	Location	Number of Broken Windows	Dust Visible Initially	Dust Visible Currently	Residence Occupied	Cleaning Method	Aggressive Sampling	Level of Dust in Photo	Photo Comments

AA = asbestos abatement professionals
C = contractor
LI = large increase
M = moderate increase
MS = building management staff
N = no
NI = no increase
O = owner/tenant
SI = slight increase over normal
UNK = unknown
Y = yes

Appendix C. Detailed Analytic Results

Results of Fiber Analyses

Results of fiber analyses in air and dust samples from 30 residential buildings (1–30) in lower Manhattan and 4 comparison buildings (31–34) above 59th Street. The range of values measured in the comparison buildings is shown in the summary of comparison areas above 59th Street.

Building Number	Sample Location	Results From Air Samples			Results From Dust Samples		
		Fibers in Air PCM (f/cc)	Asbestos in Air TEM (f/cc)	SVF in Air SEM (f/cc)	Asbestos in Dust PLM (%)	Asbestos in Dust TEM (%)	SVF in Dust PLM (%)
Summary of Comparison Areas Above 59th Street							
	Outside	<.001–0.001	NA	ND–<.000043	Not Sampled	Not Sampled	Not Sampled
	Common	<.001–0.002	NA	ND–0.000043	ND	ND	ND
	Residences	<.001–0.003	NA	ND–0.000087	ND	ND	ND
Results for Individual Buildings Sampled in Lower Manhattan (Buildings 1–30)							
1	Outside	0.001			ND	<1	22
1	Common	<.001			Not Sampled	Not Sampled	Not Sampled
1	Residence 1	0.006	<.001	0.000162	ND	NA	20
1	Residence 2	<.001			ND	NA	20
2	Outside	0.003			<1	1.2	28
2	Outside co-located	Not Sampled	Not Sampled	Not Sampled	1.3	NA	25
2	Common	0.005	<.001	0.000255	ND	NA	27
2	Residence 1	<.001			ND	NA	25
2	Residence 2	0.002			ND	NA	20
2	Window sill	Not Sampled	Not Sampled	Not Sampled	<1	<1	30
3	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
3	Res 2 co-located	<.001			Not Sampled	Not Sampled	Not Sampled
3	Common	<.001			Not Sampled	Not Sampled	Not Sampled
3	Residence 1	<.001			Not Sampled	Not Sampled	Not Sampled
3	Residence 2	<.001			Not Sampled	Not Sampled	Not Sampled
4	Outside	0.001			Not Sampled	Not Sampled	Not Sampled
4	Outside co-located	<.001			Not Sampled	Not Sampled	Not Sampled
4	Common	0.001			ND	<1	15
4	Common co-located	0.001			Not Sampled	Not Sampled	Not Sampled
4	Residence 1	<.001			ND	<1	2
4	Residence 2	0.001			ND	<1	5
5	Outside	0.002			3.4	NA	25

Building Number	Sample Location	Results From Air Samples			Results From Dust Samples		
		Fibers in Air PCM (f/cc)	Asbestos in Air TEM (f/cc)	SVF in Air SEM (f/cc)	Asbestos in Dust PLM (%)	Asbestos in Dust TEM (%)	SVF in Dust PLM (%)
5	Outside co-located	0.003			Not Sampled	Not Sampled	Not Sampled
5	Common	0.002			Not Sampled	Not Sampled	Not Sampled
5	Residence 1	0.002			<1	<1	10
5	Residence 2	<.001			ND	<1	20
6	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
6	Common	<.001			ND	<1	10
6	Res 2 co-located	0.002			Not Sampled	Not Sampled	Not Sampled
6	Residence 1	<.001			ND	ND	15
6	Residence 2	<.001			ND	ND	15
7	Outside	<.001			ND	1.7	35
7	Common	0.001			ND	ND	5
7	Residence 1	0.001			ND	ND	ND
7	Residence 2	<.001			ND	ND	5
7	Window sill (R2)	Not Sampled	Not Sampled	Not Sampled	ND	ND	40
8	Outside	0.001			Not Sampled	Not Sampled	Not Sampled
8	Common	0.002			ND	ND	ND
8	Residence 1	0.003			ND	ND	ND
8	Residence 2	0.002			ND	ND	ND
9	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
9	Common	0.001			ND	ND	7
9	Common co-located	0.001			Not Sampled	Not Sampled	Not Sampled
9	Residence 1	0.001			ND	<1	2
9	Residence 2	0.003			ND	<1	5
10	Outside	0.001			ND	ND	ND
10	Common	0.002			ND	1.5	20
10	Common, TEM re-analysis					<1	
10	Residence 1	0.001			ND	ND	15
10	Residence 2	0.001			ND	ND	10
11	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
11	Common	<.001			ND	ND	ND
11	Common co-located	<.001			Not Sampled	Not Sampled	Not Sampled
11	Residence 1	<.001			ND	<1	ND
11	Residence 2	<.001			ND	1.5	ND
12	Outside	<.001			Not Sampled	Not Sampled	Not Sampled

Building Number	Sample Location	Results From Air Samples			Results From Dust Samples		
		Fibers in Air PCM (f/cc)	Asbestos In Air TEM (f/cc)	SVF in Air SEM (f/cc)	Asbestos in Dust PLM (%)	Asbestos in Dust TEM (%)	SVF in Dust PLM (%)
12	Common	<.001			ND	ND	ND
12	Residence 1	0.001			ND	ND	5
12	Residence 2	<.001			ND	ND	5
13	Outside	0.001			Not Sampled	Not Sampled	Not Sampled
13	Common	0.001			ND	ND	ND
13	Residence 1	0.003			ND	ND	10
13	Residence 2	0.002			ND	ND	ND
14	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
14	Common	0.0013			ND	ND	5
14	Residence 1	0.001			ND	ND	ND
14	Res 1 co-located	<.001			Not Sampled	Not Sampled	Not Sampled
14	Residence 2	<.001			ND	ND	ND
15	Outside	<.001			ND	1.9	72
15	Common	0.001			ND	ND	ND
15	Residence 1	<.001			ND	<1	ND
15	Residence 2	<.001			ND	ND	5
16	Outside	<.001			ND	ND	1
16	Common	<.001			ND	ND	ND
16	Residence 1	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled
16	Residence 2	<.001			ND	ND	ND
16	Res 2 co-located	Not Sampled	Not Sampled	Not Sampled	ND	NA	ND
16	Res 2 filter piece	Not Sampled	Not Sampled	Not Sampled	ND	NA	ND
17	Outside	<.001			Not Sampled	Not Sampled	Not Sampled
17	Common	<.001			ND	ND	2
17	Residence 1	<.001			ND	ND	ND
17	Residence 2	<.001			ND	ND	ND
18	Outside	<.001			ND	ND	30
18	Common	<.001			ND	ND	ND
18	Residence 1	0.002			ND	ND	30
18	Residence 2	0.002			ND	ND	35